RANGE SUSTAINMENT PROGRAM

HQ Air Force Center for Environmental Excellence

BDU-33 Target Design Guidebook

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Dear Jon:

Here are the final documents for our work with you on the BDU-33 Target Design Guidebook. The team here at WESTON® want to thank you for giving us this opportunity to participate on such an interesting and timely project. We thoroughly enjoyed working with you and hope that we can continue our relationship in future range sustainability initiatives.

Please don't hesitate to call Peter Ciotoli at (610) 701-7581 if you have any questions or concerns.

Very truly yours,

Weston Solutions, Inc.

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AK/wp

cc: Peter Ciotoli

Gary Witmer

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Executive Summary

Military range properties are receiving increased regulatory and public scrutiny. Off-base migration of unexploded ordnance (UXO) and its constituents are steadily swelling public concerns. Encroachment and military facilities slated for closure are bringing the public and UXO in closer proximity. Additionally, throughout the 20th century, the United States has been involved in several wars and many conflicts, and these ranges and target areas have been used to train our nation's armed forces. The result is a legacy of degrading UXO that not only presents an acute explosive hazard but also a chronic contaminants concern. Therefore, to ensure that ranges can remain a viable resource for future training needs, it is imperative that they be designed and managed in a manner that is compatible and consistent with public safety and environmentally sound.

Purpose Statement:

This guide is intended to minimize future impacts of UXO on human health and the environment by providing guidance in the use, siting, and design of new range and target areas. Specifically, this guide focuses on designing targets to be used primarily by the BDU-33 training munition. Several Air Force, Navy, and Marine aircraft currently use the BDU-33 munition in many of their training activities.

This guide is to be used by operators, designers, and managers of BDU-33 target areas. It establishes a set of design criteria, and provides areas to examine for potential environmental impacts resulting from the use of the BDU-33 munition and possible mitigative measures to reduce impacts. While the considerations identified in this guide will not completely eliminate all hazards and risks associated with BDU-33, they will help reduce future liabilities associated with BDU-33 during training activities.

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Chapter 1

Introduction

1. Background

The BDU-33 Target Design Guidebook is designed to assist target and range designers, users, and maintainers in identifying potential adverse conditions that may affect a range or target area's viability. While no two targets or ranges are the same, they often have many similarities. This Guidebook identifies many issues that may affect the long-term use of a target area or range and presents them in a manner that allows for a methodical evaluation of the design and placement of a target on a range. This is in keeping with the Air Force's philosophy of "Design Use, Closure," which attempts to integrate all aspects of a range's life cycle.

This Guidebook focuses predominantly on targets designed for the BDU-33 Practice Munition. It is recognized that a target designed solely for the use of this munition is unrealistic. Often a target area will support many weapon platforms, munitions types, and operational requirements. However, since the BDU-33 maintains such a significant role in the training requirements of many aviators, it has been selected as a primary munition type for the purpose of this Guidebook and the design of target areas using primarily practice munitions.

1.1 Use of this Guidebook

This Guidebook is intended to provide a methodical approach to designing ***new*** target areas. It is a compilation of various environmental, sociological, and operational considerations. The Guidebook's primary intention is to help users identify potential aspects of the design, operation, and maintenance that could impact or be impacted by these considerations. In some cases there are laws, regulations, or ordinances that may dictate certain requirements that must be met. Where possible these regulations are provided in the discussion. However, it is not feasible to cite every legal driver affecting target design; therefore, the text focuses on only those deemed significant to the discussion.

> *Note:* While not required, it may be useful for some range managers to re-assess their existing targets using the guidelines provided in this document.

Users of this Guidebook should consult a variety of experts and sources when designing new target areas. Target design cannot be done solely from a computer; it takes a real-world understanding of the site conditions and issues that may affect the mission. This Guidebook should help highlight sources for

obtaining these real-world perspectives. In some cases examples are provided in order to assist users conceptually. However, they are by no means all-inclusive and cannot replace real-world experience.

1.2 Mission Requirements

This section is designed to provide users with an overview of how mission requirements are developed and the various issues under consideration when developing these requirements. The philosophy of this text is not to attempt to alter mission requirements, but to understand their development and purpose. Designers must understand the fundamental drivers behind the mission, including why a particular mission is needed, what weapons systems it involves, and how they are deployed. By understanding these basic requirements designers and range operators can more effectively manage their target and range resources.

> *Note*: Even though the intent of the document is to not alter mission requirements, there are cases where "no drop" alternatives should be considered (e.g., training required in rugged terrain). In these cases maintenance or unexploded ordnance (UXO) clearance costs may result in severe safety considerations and/or be prohibitively expensive. Designers need to work closely with operators and range managers to identify such situations where this potential option may be needed.

1.3 Sustainability Matrix

The Sustainability Matrix is the primary tool offered by this Guidebook. Target designers can use the matrix as a checklist to ensure a new target has been thoroughly evaluated. This evaluation encompasses myriad environmental, sociological, and operational considerations. It also attempts to identify at a macro level the type of risk presented by certain design decisions. Each section is referenced to a chapter and paragraph presented later in this Guidebook. These chapters were developed to provide further discussion on specific considerations in order to give designers a fuller perspective of the issue being presented.

It is important to note that both the Guidebook and the Matrix assume that all the mission requirements have been made and properly identified prior to target design or site selection. Therefore, discussions focus on site or design modifications that can be used to enhance the target sustainability, not on modifying mission parameters. In a very few cases suggestions are made as to the time of year or day a mission can be conducted in order to minimize adverse impacts. However, if, for example, a mission dictates a twilight or cold weather requirement, then recommended variance or mitigative measures would not apply.

1.3.1 Implementation

While the matrix cannot identify every individual concern facing a target area, it does provide a comprehensive overview of the potential impacts and considerations facing target sustainability. In addition, it is highly recommended

that a cross-functional team be used in concert with this document when designing or evaluating a proposed target area. Such a team may be composed of personnel from the Range Squadron or office (including the airspace manager), pilots using the range, Engineering, Maintenance Engineering, CE Operations, contracting, and environmental. This will ensure optimal design and sustainability success. It is imperative, however, that mission needs be properly identified and justified up front. Users must know exactly what needs to be accomplished and why. This information must then be successfully conveyed to the designers and planners. Only when sound mission requirements can be effectively communicated to all impacted parties will users realize maximum land use sustainability.

Throughout the matrix you will see decisions that lead to a risk management category. In many cases risks can fall under more than one category. While it is anticipated that a variety of personnel will be required to make assessments on all the aspects provided, ultimately, it is the Range Commander who will weigh the options and decide which risks are acceptable.

Chapter

2

Mission Requirements

2. Background

Before any design can begin, user requirements must be evaluated. These requirements will undoubtedly change throughout the life cycle of the facility; therefore, keeping the design flexible is critical to maintaining its usefulness and longevity. This chapter helps outline the procedure for establishing these requirements. It is not intended, however, to take the place of the actual Air Force Instructions (AFIs), and users should consult the appropriate AFIs and FARs prior to commencing any formal requirements process. Additionally, for the most part, this Guidebook assumes that the Mission Requirements have been properly established and validated. Therefore, target design variations and mitigative measures are limited in scope and minimize making recommendations to modify established Mission Requirements.

2.1 Requirement Development Process

In accordance with *Air Force Instruction (AFI) 13-212 Volume I – Range Planning and Operations, Para 3.2*, before any design or modifications can be performed on range property, the user must submit a validated Test and Training Space Needs Statement (T/TSNS). Users describe the concept, action, and alternatives in a T/TSNS. New and ongoing T/TSNSs are addressed at the applicable range and airspace meetings to provide a regional perspective to ongoing initiatives. The T/TSNS is a brief document, in plain letter and/or outline, designed to facilitate the airspace/range review process. The T/TSNS aids the process and outlines some of the potential issues associated with proposed test/training actions. It provides a standard vehicle to obtain MAJCOM, Air Staff, and FAA review, assistance, and validation. The T/TSNS is the first step in the Air Force Environmental Impact Analysis Process (EIAP).

Once the Air Staff reviews/comments on the T/TSNS, the next step is to write a Description of the Proposed Action and Alternatives (DOPAA).

> "The DOPAA provides the framework for assessing the environmental impact of a proposal. It describes the purpose and need for the action, the alternatives, and the rationale used to arrive at the proposed action. The T/TSNS serves as the starting point for developing the DOPAA. The DOPAA includes a *Background/Purpose* statement, a section detailing the *Need*, a *Proposed Action* section, and a section listing the *Alternatives*. The

remaining three sections reiterate the *Decision to be Made*, provide the *Identification of the Decision Maker*, and outline any *Anticipated Issues*. Although the proponent of the action is the one tasked to provide a complete DOPAA, the development of the DOPAA is a team effort. It is essential that operations, engineering, legal, logistics, plans, and others on the staff work together to provide all relevant inputs to ensure the DOPAA portrays an accurate description of the proposed action and alternatives. For DOPAA preparation guidance, refer to AFI 32-7061, *The Environmental Impact Analysis Process." (AFI 13-212 Vol. I, Para 3.3.1)*

The following criteria are important aspects of a DOPAA addressing needs associated with use of the BDU-33, its target area, and its proposed training activities.

2.2 Airborne Platforms

Weapons delivery platforms are key components of any target and range design. The platform will help identify drop characteristics that will impact target use and placement. Additionally, primary airspace considerations will be dependent on the delivery platforms, their routes, and maneuver requirements. The following items are important when identifying platform requirements:

- Identify aircraft types that will be primary users of the target area.

- Primary users should be within the operational radius of the proposed range to permit unrefueled, daily use, while optimizing training activities with administrative transit time. This is most important for the daily users of the range. Occasional users may be able to adapt to other arrangements such as refueling, deployment, etc.

- Weapons delivery profiles affect the size of the weapon safety footprint area (WSFA). Low-angle, low-speed approaches normally allow for smaller WSFAs, while high-angle, high-speed approaches often require a much larger area. Ultimately the various types of aircraft, run-in headings, and delivery profiles for each target must be analyzed so that the composite WSFAs can be determined. Additionally, the following aspects must be considered to provide trainers with adequate training space above and around the target areas.

  - Maneuvering space for multiple axes of attack.

  - High-altitude attack maneuvers.

  - Accessibility of the training space by established Military Training Routes (MTRs) and/or low-altitude Military Operations Areas (MOAs).

  - Ensure there is adequate airspace for aircraft maneuvering and weapons deployment. Proximity of airports, published airways, jet routes, restricted

airspace, MOAs, MTRs, low-altitude training (LOWAT) areas, and nearby communities must not constrain DOD use/access of airspace.

- Scoring and aircrew feedback systems—These systems are important in the training environment, for both aircrews and supervisors. Some common remotely operated scoring and feedback systems include: Television Ordnance Scoring System (TOSS); Joint Advanced Weapon Scoring System (JAWSS); aircraft instrumentation systems such as the Air Combat Training Systems (ACTS); future systems such as the Joint Tactical Combat Training System (JTCTS); and other rangeless/untethered ACTS.

2.3 Munitions

Munitions are an equally important consideration in target and range design. The munition type will impact the weapon safety footprint, clearance requirements, and delivery requirements. This guidebook focuses primarily on the BDU-33; however, it should be realized that no target area would be solely used for the BDU-33 and users should anticipate encountering other munitions on their targets, either intentionally or unintentionally.

2.3.1 BDU-33

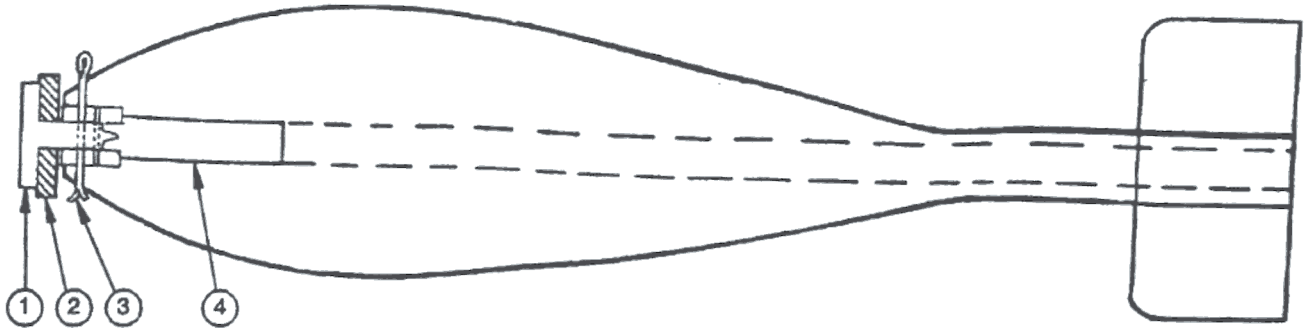
The following information can be found in the Air Force's TO 11A3-3-7-Specialized Storage and Maintenance Procedures, BDU-33. The BDU-33 is a 25-lb practice bomb. (For purposes of discussion the Navy's MK76 is considered the same as the BDU-33.) The primary use of the BDU-33 is to test launch/release mechanisms on weapon delivery platforms. However, because of their economical nature, easy loading, and small storage footprints, they have become a major component of the Air Force's training program. The BDU-33 munition allows safe and economical training because it enables pilots to practice a variety of drop maneuvers without the hazards and risks associated with its high-explosive counterparts.

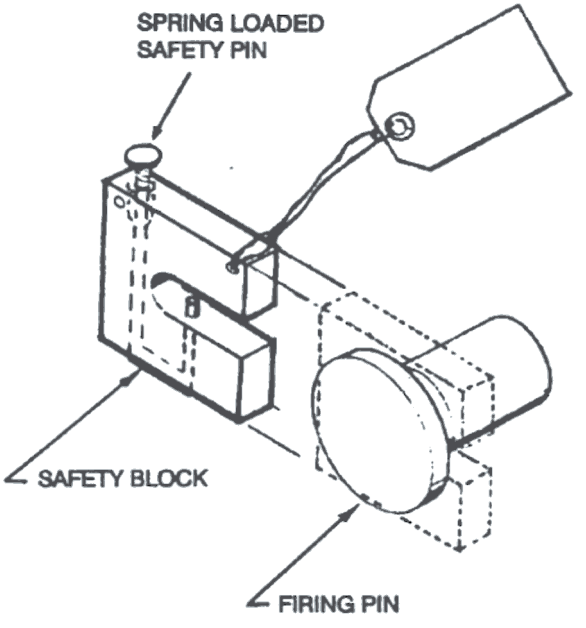
- Types—The BDU-33 is available in two mods, the BDU-33 B/B and the BDU-33 D/B (see Figure 2-1).

- Expected Quantities—FY00 saw expenditures in excess of 300,000 nationwide. Individual ranges may experience considerable variations in quantities. However, quantities should not exceed quantities listed in the range's EIAP. Expected quantities will be based on the number of aircraft anticipated to use the range and the type of training expected to be performed. These quantities will be used to determine maintenance needs and help assess the risk associated with property closure.

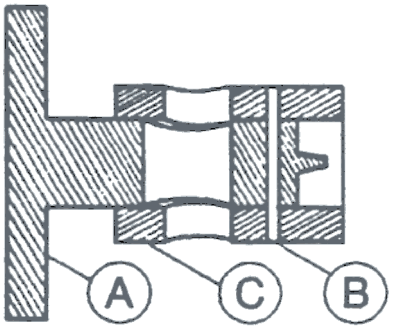
- Technical Information—The BDU-33 has a teardrop-shaped metal body with a tube cavity lengthwise through the center. The afterbody is conical with a cruciform-type fin. It is mounted by a single-suspension lug located just forward of the center of gravity on the top of the bomb. The BDU-33

Figure 2-1 BDU-33 D/B





1. FIRING PIN ASSEMBLY
2. SAFETY BLOCK
3. COTTER KEY RETAINING PIN
4. MK4 MOD 3 SIGNAL CARTRIDGE



A. FIRING PIN
B. SHEAR PIN
C. OUTER COLLAR

FIRING PIN ASSEMBLY CUTAWAY

G8901119

D/B can use either the MK4 Mod 3 or the CXU 3 A/B. Both are percussion primed; however, the B/B uses impact inertia to drive the signal cartridge into the firing pin, while the D/B drives the firing pin into the signal cartridge upon impact.

- Explosive Considerations—The only explosive considerations are located in the MK4 Mod 3 and CXU 3 A/B signal cartridges.

  - MK4 Mod 3—This signal cartridge has an aluminum case and is similar to a 10-gauge shotgun shell. It contains an expelling charge of smokeless powder and is primed with a commercial shotgun shell primer. A pyrotechnic marker load (stabilized red phosphorus) is separated from the expelling charge by a disc and cardboard gun wad. The end of the shell is closed by felt gun wads, which are cemented to the cover (see Figure 2-2).

    - When the practice bomb in which the signal cartridge is installed strikes water or earth, impact causes the firing pin in the bomb to impinge upon the primer of the cartridge. This primer ignites and expels the charge, forcing the cartridge's load out through an opening in the bomb. This results in a flash and puff of white smoke, which is used by range controllers to score the hit.

  - CXU 3 A/B—This signal cartridge has the same characteristics as the MK4 Mod 3, except the expelling charge has 2.0 grams of smokeless powder, and a glass vial containing 17 cc of titanium tetrachloride (TC) and Number 209 primer.

    - Upon impact the firing pin/striker assembly is driven rearward, striking the primer. This action then initiates the propellant in the pressure generator. Gases from the burning propellant expand to drive the TC payload rearward and out of the tube. The TC reacts instantly with the surrounding air to produce an intense white cloud, which persists from 15 to 30 seconds or longer, depending on wind conditions.

- Weapons Delivery Profiles—The SAFE-RANGE program, established in *Air Force Instruction 13-212 Vol. III, Safe-Range Program Methodology*, provides a statistical analysis on the WSFA associated with the BDU-33.

  - Safety Footprints for the BDU-33 are available in Appendix A.

  - Altitude and airspace requirements supporting the WSFA are as follows:

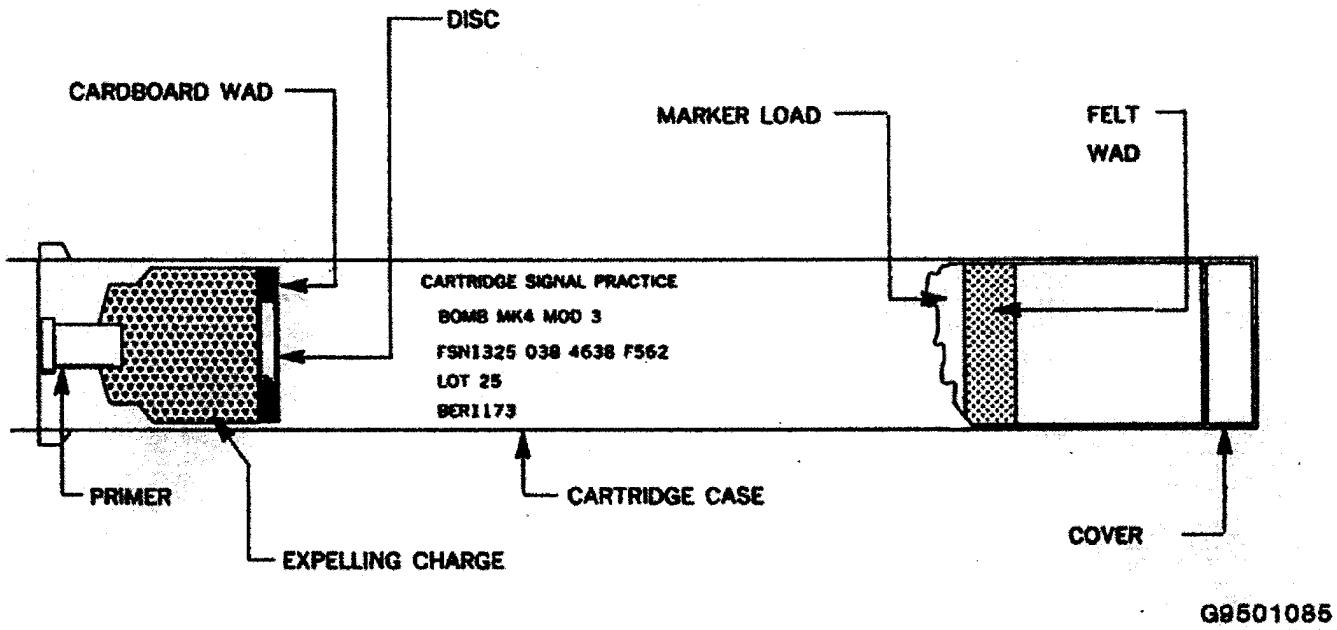
    - Aircraft Type

    - Weapon Type

    - Event Type - This is a description of the weapon delivery event.

    - Dive/Climb Angle - This specifies the degree at which the aircraft is diving or climbing when the weapon is released.

Figure 2-2 MK4 Mod 3 Signal Cartridge



- Release Altitude - This is the aircraft's vertical distance above the ground at weapon release.

- Release Speed - This is the true air speed of the aircraft at weapon release.

2.3.2 Other Munitions

Since it is unlikely that the BDU-33 will be the only munition used on a proposed target area, other munitions should be anticipated and included in the design. For example, many training ranges allow users to drop large inert bombs or weapon shapes, such as the BDU-50 or BDU-36, on their targets. Others might include 2.75-inch rockets (practice or WP), aircraft cannon (strafing), and flares. Often Smoky Sams are used to simulate ground threats against aircraft using the range. Explosive ordnance disposal (EOD) operations may present additional environmental concerns. Therefore, realistically, target design should incorporate other compatible operations and munitions.

The BDU-61 (a.k.a. No. 3 MK52), a 3-kg (7-lb) practice bomb manufactured by Portsmouth Aviation Limited, is currently being evaluated as a replacement for the BDU-33.

2.4 Range and Target Types

AFI 13-212 Vol. 3 limits the types of ranges to three basic categories and targets to two. The types of ranges and targets will affect the required buffer space surrounding the impact areas.

- Ranges

  - Controlled Ranges—A controlled range has specified run-in headings and patterns, the capability to score events from the ground, and a dedicated Range Control Officer (RCO). There are numerous visual cues to aid aircrews in identifying targets such as run-in lines, foul lines, plowed bomb circles, etc. A controlled range provides aircrews with basic proficiency in weapons delivery. Conventional and simulated nuclear ranges are examples of this type of range.

  - Low-Threat Tactical Range—These ranges permit varied tactics and attack headings, and allow air crews to operate under their own control or that by Forward Air Controllers (FAC). There are limited visual cues to aid aircrews in identifying targets. Simulated enemy air defenses are limited or nonexistent. The tactical ranges are the transition steps between the controlled range, with precisely configured targets and combat. The types of deliveries and directions of attack on these ranges are limited only by the size of the range, local restrictions, and ordnance type.

  - High-Threat Tactical Ranges—These are similar to low-threat tactical ranges except they contain significant simulated enemy air defenses, which demand more aircrew attention during attack and weapon delivery.

- Targets

  - Soft Target—These types of targets pose a minimal ricochet effect and are located on or over a soft surface, such as soil. Examples are the joint modular ground target (JMGT) constructed of sheet metal, wood-constructed targets, and "soft" vehicles with engines and transmissions removed.

  - Hard Target—These targets pose a high potential for ricochets. Examples include armored vehicles, runways, concrete lego blocks, and vehicles with engines and transmissions intact. A soft target located on a hard surface should be considered a hard target.

  - Laser Designators—Pave Tack, LITENING, and LANTIRN may require appropriate despecularization.

AFI 13-212 Volume II – Range Construction and Maintenance Chapter 1 suggests target configurations for a range. There are also minimum size recommendations for the various types of targets. It is recommended that these requirements be thoroughly reviewed and matched with user needs during the design process.

2.5 Operational Requirements

Operational requirements will need to be established that identify the goals of the platform and munition used. This may include establishing training maneuvers or performing operability tasks that verify the platform's munition release capabilities. When possible, these requirements should be associated with real-world or war-time tasks. Enhanced target or range sustainability can be realized when users can confidently answer public concerns, "Why this platform, with this munition, in this manner?"

The following points should be addressed when determining or establishing the training mission's operational requirements.

- AFI 11-214—Aircrew, Weapons Director, and Terminal Attack Controller Procedures for Air Operations, AFI 13-201, *Air Force Airspace Management,* unit/MAJCOM airspace/range managers, and the assigned Air Force Representative (AFREP) will have more information on identifying operational needs.

- Initial Point (IP - Beginning of the weapons delivery run-in) to target distances. This distance will vary depending upon the type of training being performed. It defines the lead in land and airspace requirements.

- Types of training

  - High Altitude—High-altitude operations are much more airspace intensive than low-altitude operations because of the larger turn radii, longer time of fall of the weapon, incursions into the Class A airspace above 18,000 ft, wind-related problems, etc. Additionally designers may

want to consider formation operations, and numbers of weapons dropped per pass (an F-16 dropping a single bomb versus a B-1 dropping 84). In some cases designers may need to build in space for breakaway maneuvers, etc.

- Supersonic—The effect of sound barrier (achieving or exceeding Mach 1) issues should be considered during siting and design.

- Night operations—Consideration should be given to necessary lighting and altitude requirements (AFI 13-212 Vol. 1 and AFI 11-214).

- Types of users

  - Proficiency versus Training—Aircrew members learning new maneuvers or tactics may require a larger buffer zone for inadvertent releases.

  - Specify whether the range is shared with another service or the test community. Aircrew members from other services or countries may not be familiar with the target area boundaries or locations. This can result in releases occurring off target. Range management procedures should be developed that highlight target-area specifics. However, if typical users are nonlocal, target designers should expend extra effort to ensure the target areas are clearly defined and identifiable from the air.

  - Capability to support composite force exercises. Users must be aware of this need early in the process since this factor may have a far-reaching impact on the various controlling agencies and may require a large training space.

- Address range time availability to meet mission requirements. Users must consider the number and length of range periods, day and night, needed for all operations. Include time needed for daily, weekly, monthly, quarterly, and annual maintenance and residue clearance periods. Additionally this must be coordinated with the local community and corresponding regulators.

- Atmospheric Pressure—The airspace structure above 18,000 ft is based on a common altimeter setting. Aircrews change to 29.92 (standard atmospheric pressure) at 18,000 ft during a high ascent, making it Flight Level (FL) 180. The problem is that during descent, with low pressure, aircrews could be changing much lower than 18,000 ft if they wait for an FL180 reading from their instruments. Thus, there will be a minimum flight level to transition to local altimeter settings, and the airspace structure of most restricted areas and MOAs that top out at FL180 are lowered on those days to prevent conflicts with other air traffic. Therefore, designers need to either ensure the range is topped at 18,000 ft versus FL180, or write procedures to avoid the conflict. Or, designers may avoid the issue entirely by topping the target areas at or below 17,000 ft or at or above FL190. The procedure is outlined in the Flight Information Handbook (FIH), section B, Metrological Information.

- Ground-based control aspects

  - Facility locations—Topography or vegetation may limit the siting of various control towers or other range operations facilities. Additionally, if the number of users is significant enough to warrant the construction of a dual conventional target area, adequate air and ground space is necessary to provide safe working conditions for ground maintenance activities in the alternating target area. Thus, overflight conditions must be minimized.

  - Scoring systems—Range controller towers may be required. They will need to be sited according to AFI 13-212, Vol. 2, Chapter 1.

  - Radar—Must be designed and evaluated for their effect on operations, personnel, and the environment. Radar use may be limited by topography, vegetation, or range operations.

  - Laser—When Pave Tack, LITENING, LANTIRN, or similar-type systems are used, protection of personnel requires appropriate despecularization of targets.

  - Communication Equipment—Radio towers, transmission lines, etc., may present environmental considerations as well as implications on training and range operations. Designers should evaluate land and airspace impacts.

  - Utilities—Power, water, wastewater, and fuel systems will need to be sited to minimize impacts on training, operations, and the environment. Designs must include all aspects of utility support required by the operation.

  - Threat Emitters—Electronic threat emitters simulate certain enemy air defenses that aircrews might face. Aircrews may then take appropriate evasive maneuvers or use other countermeasures, such as chaff, flares, or electronic signals. Certain training scenarios may require the use of such emitters on specific target areas. Some emitters will require site preparation and power supply. The sites must be reasonably accessible to transport emitters and provide utilities as needed. Include security measures such as fencing, surveillance cameras, alarms, and signs.

  - Ensure that adequate MTRs, holding areas, and range entry and exit points are available.

  - Ensure the target area is reasonably accessible to the operating agency. Driving time, roads, and road conditions must be suitable for routine maintenance and residue clearance procedures.

  - UXO Disposal Controls—Ensure EOD operations have adequate controls established to provide for the safety of aircraft and personnel.

Range residues should be sited and marked as "no drop" areas, to prevent aircraft from accidentally engaging them as targets.

- Identify the level of flexibility that may be required to restructure targets and threats to meet current and projected mission requirements. Periodically creating new layouts can keep the training missions challenging and help reduce pilot complacency. Therefore, potential areas and scenarios that may offer this flexibility are encouraged.

Chapter

3

Earth Resources

3. Earth Resources

3.1 Geographic Location

3.1.a. Does the size of the land and airspace meet mission requirements?

Land and airspace area must meet mission requirements. Weapon systems requiring long-range standoff will naturally require more area.

Yes ➡ **Continue to 3.1.b**

No ➡ Can a variance or mitigative measures be applied?

Future uses should be anticipated that might alter size requirements. By working with weapon planners and local developers, future incompatibilities can be minimized. Involve local community leaders, planners, and zoning boards to create easements and buffer zones around range.

Yes ➡ **Continue to 3.1.b**

No ➡ Site is unsatisfactory

3.1.b. Is the weapon safety footprint compatible with the selected location?

Weapon safety footprint orientations must be compatible with buffers, land, air, and waterway uses.

Yes ➡ **Continue to 3.1.c**

No ➡ Can a variance or mitigative measures be applied?

Ensure land, air, and water assets have the flexibility to meet long-term mission requirements that might affect existing and future weapon safety needs.

Yes ➡ **Continue to 3.1.c**

No ➡ Site is unsatisfactory

3.1.c. Are impacts to existing targets or military operations minimized?

Locations of existing targets may interfere with the proposed site of a new target.

Yes ➡ **Continue to 3.1.d**

No ➡ Can a variance or mitigative measures be applied?

Consider inactivating or relocating a target, or adjusting target use schedules.

Yes ➡ **Continue to 3.1.d**

No ➡ Go to Risk Management Considerations at end of matrix.

3.1.d. Has the topography been evaluated for its impacts on O&M requirements?

Topography can impact the user's ability to access and maintain a target; however, mission needs may require training in such environments.

Yes ➡ **Continue to 3.1.e**

No ➡ Can a variance or mitigative measures be applied?

Consider adjusting or designing targets so as to minimize O&M requirements. May incur increased costs for maintenance and closure.

Yes ➡ **Continue to 3.1.e**

No ➡ Go to Risk Management Considerations at end of matrix.

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3.1.e. Is the proposed target area not easily accessible by unauthorized personnel?

Accessibility of the proposed target area will impact safety, security, and O&M of target areas.

Yes ➡ Continue to 3.2.a

No ➡ Can a variance or mitigative measures be applied?

Identify potential access routes in and on target area, and their anticipated uses early in the design process. Consider adding buffers, fencing, and security to minimize unauthorized access.

Yes ➡ Continue to 3.2.a

No ➡ Go to Risk Management Considerations at end of matrix.

3.2 Air Corridors

3.2.a. Is air space use optimized?
FAA Directives require that the military accommodate the maximum number of operations in existing airspace and limit the proliferation of new airspace.

Yes ➡ Continue to 3.3.a

No ➡ Can a variance or mitigative measures be applied?

Users must ensure they comply with AFIs 13-201, 32-7061, and applicable FAA Directives.

Yes ➡ Continue to 3.3.a

No ➡ Site is unsatisfactory

3.3 Environmental Baseline

3.3.a. Has an environmental baseline been established?

Analysis and documentation of existing environmental resources (e.g., groundwater, surface water, air, land, natural, cultural) to evaluate long-term or future impacts. An attempt should be made to collect the described information and to identify any pre-existing environmental or industrial condition prior to acquisition or development.

Yes ➡ Continue to 3.3.a

No ➡ Conduct baseline assessment.

Site has no pre-existing conditions that will adversely affect mission requirements.

Yes ➡ Continue to 3.3.a

No ➡ An environmental baseline must be established. Return to 3.3.a.

3.4 Soil Structure

3.3.a. Is the soil structure compatible with mission requirements?

Range use will dictate whether soils must be highly compacted to hold the weight of large vehicles or targets. Loose soil may instead be needed to minimize ricochet.

Yes ➡ Continue to 3.5.a

No ➡ Can a variance or mitigative measures be applied?

Are engineering controls required/practical to limit ordnance penetration, or to enhance soil structure? Consider use of softened/salvaged vehicle for a target.

Yes ➡ Install engineering controls Continue to 3.5.a

No ➡ Continue to 3.5.a

SUSTAINABILITY MATRIX

3.5 Ground Cover

3.5.a. Is the ground cover compatible with mission requirements?

Ground cover can act as a soil stabilizer to reduce erosion risks. However, native plant species must be considered when choosing ground cover to minimize impacts to the local ecosystem.

Yes ➡ Continue to 3.6.a

No ➡ Can a variance or mitigative measures be applied?

If native species cannot be used consider engineering or natural controls when using alternative species. If environment cannot support natural ground cover, consider engineering controls such as geotextiles.

Yes ➡ Use ground cover Continue to 3.6.a

No ➡ Continue to 3.6.a

3.6 Sedimentation

3.6.a. Are targets located away from water bodies?

Locate targets away from rivers, creeks, and other water bodies to reduce the risk of sedimentation, unless otherwise dictated by mission requirements (e.g., the need for bridge or coastal zone targets). Sedimentation is a transport mechanism for UXO constituents.

Yes ➡ Continue to 3.7.a

No ➡ Can a variance or mitigative measures be applied?

Engineering controls should be evaluated to avoid sedimentation of local water bodies. A periodic monitoring program may be required.

Yes ➡ Continue to 3.7.a

No ➡ Go to Risk Management Considerations at end of matrix.

3.7 Stability

3.7.a. Are targets located away from steeply sloped areas?

Targets should not be located in a steeply sloped area because of erosion, sedimentation, and target maintenance and UXO clearance concerns. (Unless dictated by mission requirements.)

Yes ➡ Continue to 3.8.a

No ➡ Can a variance or mitigative measures be applied?

If required by mission, then evaluate engineering controls to limit erosion (e.g., natural ground cover, riprap, fencing) and consider targets that require less maintenance.

Yes ➡ Continue to 3.8.a

No ➡ Go to Risk Management Considerations at end of matrix.

3.8 Erosion

3.8.a. Are soil conditions evaluated to ensure minimum erosion concerns?

Targets should not be located in an area where soil, water, and ground cover will be adversely affected by erosion.

Yes ➡ Continue to 3.9.a

No ➡ Can a variance or mitigative measures be applied?

Evaluate best management practices that reduce soil loss due to erosion (e.g., straw bales, silt fences, native ground cover).

Yes ➡ Continue to 3.9.a

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

3.9 Brush Control

3.9.a. Is brush or local vegetation compatible with range or target needs?

Brush piles created during area clearing creates a fire hazard. Brush growing around a target area should be managed in a way to minimize fire hazards, potential habitat for unwanted wildlife, and maintenance concerns.

Yes ➡ **Continue to 4.1.a**

No ➡ Can a variance or mitigative measures be applied?

Consider using brush control or other maintenance options to minimize potential hazards.

Yes ➡ **Remove the brush piles**
Continue to 4.1.a

No ➡ Go to Risk Management Considerations at end of matrix.

Earth Resources

3. Background

Before a target area can be used, the environmental impacts must be evaluated with respect to federal, state, and local regulations/guidelines. Areas of consideration include geographic location (size, airspace, existing operations, topography, and accessibility by outside entities), air corridors, environmental baseline assessment, soil structure, ground cover, sedimentation potential, slope stability, erosion potential, and brush control.

3.1 Geographic Location

This analysis should identify the potential area to be used and should address the location and size of the property. It should also provide a complete property description.

a. Fundamentally, land and airspace area must meet mission requirements. Weapons systems requiring long-range standoff will naturally require more area. If the land and airspace are too small to accommodate the mission requirements, then the mission will have to be modified or relocated to an area that can accommodate the necessary operational and safety space requirements. Alternatively, in some cases additional adjacent land may be available for acquisition to provide buffer or contain the entire safety footprint.

b. Weapon safety footprint orientations must be compatible with buffers, and air and waterway uses. Coordinate with weapon planners to estimate future area needs. Ensure that land, air, and water assets have the flexibility to meet long-term mission requirements that may affect existing and future weapon safety needs. Ensure adequate safe distance is available to conduct UXO disposal as a result of range clearance operations.

   Buffer zones or open space will be needed as required by explosive safety and operational requirements. The amount of open space needed for construction and operation will vary depending on the type of drops planned for the range. Open space should be considered part of the buffer/security area that surrounds the perimeter of the target area and the range. No recreational activities should be allowed in this open space. Guidance can be found in AFI 13-212, Volumes I, II, and III.

c. Evaluate existing military operations to determine overlaps or conflicts. Existing military operations may interfere with the proposed site of a new target. This may require coordination with other services or federal agencies (e.g., Department of Energy (DOE), Federal Bureau of Investigation (FBI), etc.) In some cases it may be possible to consider deactivating or relocating an existing target or rescheduling missions to accommodate target use.

d. Topography can impact the user's ability to access and maintain a target. For example, steep, mountainous terrain is more difficult to maintain than flatter terrains and in some cases removal of heavy munitions residue is impracticable. If mission needs require training in such environments, consider adjusting or designing targets to minimize O&M requirements. Use of difficult terrain may increase costs for maintenance and closure (such as periodic clearances in accordance with AFI 13-212 by EOD personnel).

3.2 Air Corridors

Military training routes (MTRs) must be identified in order to determine whether adequate attributes are available to meet mission requirements. FAA Regulations (FARs) require the military to accommodate the maximum number of operations in existing airspace and limit the proliferation of new airspace. Users must ensure they comply with AFIs 13-201, 32-7061, and applicable FAA Regulations. If airspace is unavailable, the site is unacceptable and an alternate location must be found.

3.3 Environmental Baseline

Analyze and document existing environmental resources (e.g., groundwater, surface water, air, land, natural, and cultural) to evaluate the long-term or future impacts of using the property as a target area. An attempt should be made to collect the described information and to identify any pre-existing environmental or industrial condition prior to acquisition or development. This baseline can be established using methods described in ASTM E 1527-00, *Environmental Site Assessments: Phase I Environmental Site Assessment Process*, and ASTM Guide E1903-97, *Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process*, and AFI 32-7066, *Environmental Baseline Surveys in Real Estate Transactions*. The Phase I Environmental Site Assessment Process defined the steps necessary to determine the baseline environmental condition of a property, including the following:

a. Records review to identify recognized environmental conditions in connection with the property. These records include federal and state environmental records (National Priorities List (NPL), Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), Resource Conservation and Recovery Act (RCRA), underground storage tank (UST), etc.); local records (landfills, registered USTs, Planning Department, utility companies, fire departments, etc.); historical information (ownership, property use); and physical (topographic maps, soil maps, aerial photographs).

b. Site reconnaissance to visually and physically observe the exterior and interior of the property and all structures to identify potential environmental concerns.

c. Conduct interviews with current owners/occupants and government agencies to determine recognized environmental conditions.

d. Report to the appropriate agencies.

The purpose of the Phase II work is to further define the environmental conditions recognized during the Phase I effort. The Phase II effort should include the following:

a. Development of a Work Plan – This Plan establishes the tasks, methods, and rationale for the proposed work.

b. Investigative Activities – Details screening and/or sampling and analyses proposed for the site.

c. Evaluation and Presentation of Data – Evaluates all information collected during both phases of the assessment to determine if the property has existing environmental concerns.

d. Presentation of Findings and Conclusions – Specifies the report format and contents.

3.4 Soil Structure

Range use requirements will dictate whether soils must be a) highly compacted to support the weight of large target vehicles, such as tanks, and provide access for trucks to bring in the targets, or b) a loose soil (gravel/sandy) to absorb the impact of the BDU-33. If a target area's soils require repair, ensure an area is identified on-site where barrow materials can be obtained to conduct target area repairs. If off-site materials are used, the potential of invasive species (e.g., plants or soil organisms) must be addressed in the appropriate National Environmental Policy Act (NEPA) documents.

A training range should be located in an area with minimal soil erosion potential. Because of the ground-disturbing nature of range activities (i.e., operations and clearance), excessive erosion would cause potential runoff/stormwater issues, potential spread of contaminants from the munitions, and reduced longevity of the area for continued use.

3.5 Ground Cover

A buffer area of ground cover is suggested. This buffer will act as a noise buffer, a visual buffer, and a security perimeter around the range or target area. In the target area, light ground cover (grasses, small shrubs) is suggested to provide a stabilizer for the soils and to reduce the risk of erosion and sedimentation to any nearby surface water. Native plant species should be considered when choosing ground cover to minimize impacts to the local ecosystem. If native species cannot be used, consider engineering or natural controls when using alternative species. If the environment cannot support natural ground cover, consider engineering controls such as geotextiles. Engineering controls may also be needed for areas where ground cover should be removed in order to support mission requirements needing target visibility (such as bomb circle or roads that are part of the target design) and for fire control so that range fires don't damage target structures (e.g., small wooden buildings and shapes, etc.).

3.6 Sedimentation

All range and target areas should, if possible, be located away from rivers, creeks, and other surface water bodies because of the potential for sedimentation from denuded soils. Sedimentation can have an impact on water quality and aquatic habitats. Loose soil types (silty, sandy soils) are more likely to cause sedimentation than other soils (clay). Sedimentation is a transport mechanism for UXO constituents, or potential RDX contamination from counter charges employed against UXO by clearance teams.

Mission requirements (e.g., the need for bridge or coastal zone targets) may dictate the need for locating targets near bodies of surface water. Engineering controls should be evaluated to avoid sedimentation of local water bodies. A periodic monitoring program may be required.

Sedimentation restraints are imposed under federal guidelines/regulations. These guidelines/regulations include the following:

- Clean Water Act (Quality Criteria for Water 1986 "Gold Book"); criteria for surface water to protect human and aquatic life.
- Fish and Wildlife Coordination Act (40 CFR 6.302, 6 App. A); (42 USC 432 et seq., 7401 and 7671q); Actions within floodplains or floodprone areas, wetlands.
- Endangered Species Act (33 CFR 320-330; 40 CFR 6.302; 50 CFR 27; 50 CFR 200; 50 CFR 402.01, .02); (33 USC 401 et seq., 33 USC 1344 and 33 USC 413, 33 USC 403, 33 USC 2101); Critical habitat, threatened or endangered species.
- Coastal Zone Management Act (16 USC 1451, et seq.); Activities affecting the coastal zone and lands therein, thereunder, and adjacent areas.
- Executive Order 11988; Actions affecting wetlands.
- Executive Order 11990; Actions affecting wetlands.
- Appropriate state and local regulations.

Risks associated with sedimentation issues include a significant impact that could affect the training mission.

3.7 Stability

Targets should not be located in a steeply sloped area because of erosion, sedimentation, target maintenance, UXO clearance, and removal of heavy munition residue concerns, unless dictated by mission requirements. If the target must be located in such an area, evaluate engineering controls to limit erosion by planting fast-spreading ground cover, installing riprap, and installing silt fencing, etc., to control erosion, and consider targets that require less maintenance.

Locating targets in steeply sloped areas has significant impact on time and cost because of the difficulty in maintaining the target. In addition, it presents a possible environmental impact because the potential for erosion is increased as vegetation is removed by training activities. This adverse environmental impact could lead to closure of the target area in order to allow restoration.

3.8 Erosion

A training range should be located in an area with minimal soil erosion potential. Because of the ground-disturbing nature of range activities (i.e., operations and clearance), excessive erosion would cause potential runoff/stormwater issues, potential spread of contaminants from the munitions, and reduced longevity of the area for continued use.

Unmitigated erosion as a result of target activities may be in violation of federal, state, and local regulations/guidelines, including the following:

- Federal Safe Drinking Water Act (40 CFR 141.11-12, 141.61-62).
- National Recommended Water Quality Criteria published as a guidance in adopting water quality standards pursuant to Section 303(c) of the Clean Water Act (40 CFR 131, revised criteria from 63 FR 67548 of 7 December 1998).
- Fish and Wildlife Coordination Act – Fish and wildlife conservation (16 USC 661 et seq., 40 CFR 6.302, 6(h)).
- Endangered Species Act (16 USC 1531 et seq., 33 CFR 320-330, 40 CFR 6.302, 50 CFR 200, 50 CFR 402.01, .02).

Erosion potential that is not well managed adds time and cost to target maintenance. In addition, the environmental impact of increased erosion (sedimentation to streams, and removal of topsoil and soil nutrients, preventing reestablishment of desirable plants) may require closure of the target area to future use. Alternatively the target may only be available for periodic use to allow vegetation to recover to reduce erosion potential.

3.9 Brush Control

Brush piles accumulated as a result of land clearing should be removed from the area due to the increased fire hazard. Brush growing around a target area should be managed in such a way as to minimize fire hazards, minimize creation of potential habitat for unwanted wildlife, and/or cause maintenance concerns.

Inadequate brush control may cause violation of the following federal regulations/guidelines:

- Endangered Species Act (16 USC 1531 et seq., 33 CFR 320-330, 40 CFR 6.302, 50 CFR 200, 50 CFR 402.01, .02)
- Coastal Zone Management Act (16 USC 1451, et seq.)

- Executive Order 11988 – Floodplain Management
- Executive Order 11988 – Protection of Wetlands
- Migratory Bird Treaty Act (16 USC 703 et seq.)

Risks associated with inadequate brush control include significant impact to time and cost, significant safety concerns presented by the accumulation of brush piles throughout the target area (including risk of fire), and adverse environmental impacts, including creation of habitat for unwanted wildlife.

Brush control must be planned to optimize operational safety and eliminate the potential for invasive plants in the target area.

Chapter

4

Wildlife

4. Wildlife

4.1 Threatened and Endangered Species

4.1.a. Has the range area been evaluated for threatened or endangered species and can potential impacts be avoided?

Required by law, the area must be evaluated for the presence of federal and state listed T&E species. Coordination must take place with the local U.S. Fish and Wildlife Service.

Yes ➡ Continue to 4.2.a

No ➡ Can a variance or mitigative measures be applied?

Relocate target area or upon consultation with USFWS, locate a target area and provide adequate mitigating measures for species of concern. Also evaluate the potential for an Incidental Take Permit.

Yes ➡ Continue to 4.2.a

No ➡ Site is unsatisfactory

4.2 Critical Habitat

4.2.a. Has the area been ruled out as a critical habitiat?

USFWS must be contacted/coordinated with if there are plans to conduct or permit an activity involving the impoundment, diversion, deepening, control, or modification of a stream or body of water or any time an activity is planned in an area designated as a Critical Habitat in the Federal Register.

Yes ➡ Continue to 4.3.a

No ➡ Can a variance or mitigative measures be applied?

Coordinate with government agencies to mitigate the impact of private or commercial development (e.g., encroachment, logging, commercial development) by creating "habitat islands" on target areas and buffer zones for T&E species.

Yes ➡ Continue to 4.3.a

No ➡ Site is unsatisfactory

4.3 Wildlife Management

4.3.a. Can wildlife be managed so that it does not adversely impact mission requirements?

Manage wildlife so they do not adversely impact mission or O&M requirements.

Yes ➡ Continue to 4.3.b

No ➡ Can a variance or mitigative measures be applied?

Locate training areas away from water bodies and migratory bird flyways (e.g., minimize Bird Aircraft Strike Hazards (BASH)).

Yes ➡ Continue to 4.3.b

No ➡ Go to Risk Management Considerations at end of matrix.

4.3.b. Are migratory or breeding areas avoided?

During certain seasons, a target area may not be accessible due to the location of breeding grounds for T&E species or because of migratory pathways.

Yes ➡ Continue to 5.1.a

No ➡ Can a variance or mitigative measures be applied?

Training areas should be located away from water bodies, feeding, nesting areas, and animal migratory paths. If not possible due to mission requirements, consider modifying mission parameters during the affected seasons. However, during these periods of downtime, other maintenance operations can be conducted.

Yes ➡ Continue to 5.1.a

No ➡ Go to Risk Management Considerations at end of matrix.

Wildlife

4. Background

Several U.S. laws, dating back to the early 1900s, recognize the value of wildlife resources to the nation, and provide that wildlife conservation measures be considered in federal decisionmaking and be coordinated among agencies. Special measures are provided to protect marine mammals, migratory birds, and plant and animal species designated as endangered or threatened. The Air Force's commitment to compliance with environmental laws and standards and conservation of natural resources is articulated in Air Force Policy Directive 32-70, *Environmental Quality*, and in related AFIs.

The presence of wildlife species may present legal barriers to the usability of a proposed target area (e.g., if threatened or endangered species are present), and/or safety hazards (e.g., bird-aircraft strike hazards, or BASH). These factors must be carefully considered in both the selection of target range areas and the missions assigned to those ranges.

4.1 Threatened and Endangered Species and Critical Habitats

The Endangered Species Act prohibits actions that jeopardize the continued existence of an endangered or threatened species, or result in destruction or adverse modification of critical habitat areas (i.e., specific geographic areas that contain resources essential to the conservation of a listed species). Threatened and endangered species are listed in federal regulations at 50 CFR Part 17, and these lists are updated periodically. Critical habitat areas are usually designated at the time a species is proposed for listing as threatened or endangered, but may be added or modified on the basis of new scientific data.

The presence of threatened or endangered species in a proposed target area, or the overlap of a proposed target area with a species' critical habitat, may render that area unusable for target purposes, or may require the implementation of mitigative measures to ensure that populations of listed species will not be jeopardized. Consultation with the U.S. Fish and Wildlife Service is required for actions that may affect a listed species, and should be undertaken early in the site selection process, ideally in concert with the review process that is required under the National Environmental Policy Act (NEPA). For proposed target areas that are within existing Air Force installations, the installation's inventory of threatened and endangered species (required by AFI 32-7064, *Integrated Natural Resources Management*) should be consulted to identify the possible presence of listed species within the target area. A biological assessment may need to be performed if there are insufficient data concerning the presence of threatened or endangered species. Detailed steps for evaluating possible impacts to listed species are described in Attachment 3 to AFI 32-7064.

4.2 Migratory Birds

Both migratory and nonmigratory birds pose a safety hazard with respect to bird-aircraft strikes. Because migratory bird populations are concentrated along

migration routes and in breeding or nesting areas, these species generally present more significant hazards for aircraft strikes. During migration, birds will typically fly at higher altitudes and flock in greater numbers than at other times of the year.

Unless threatened or endangered species are involved, the environmental impacts from bird-aircraft strikes are generally not significant since the number of individual birds killed is relatively low with respect to overall population numbers. Other environmental impacts may be more significant, including disruption of migratory routes and patterns and disturbance of breeding, nesting, roosting, or feeding areas.

To ensure safety and minimize environmental impacts, training mission parameters may need to be modified for areas where migratory birds are present in significant numbers. During the migration seasons, low-altitude missions may need to be curtailed. Mission areas should be selected to avoid migratory flyways and other areas such as water bodies where birds may congregate. Areas that are known to be used by birds for breeding, nesting, roosting, or feeding should also be avoided. In concert with the NEPA review process, commanders should consult with state wildlife biologists to ascertain the specific locations used by migratory bird species in a particular area and recommended mitigative measures. Specific measures for reducing the hazards of bird-aircraft strikes are described in AFI 91-202, *The U.S. Air Force Mishap Prevention Program*, and Air Force Pamphlet 91-212, *Bird Aircraft Strike Hazard (BASH) Management Techniques*. Additional references can be found at the AMC BASH web site https://www.amc.af.mil/se/sef/bash/bash.htm and Avian Hazard Advisory System (AHAS) https://www.ahas.com.

4.3 Marine Mammals

Ocean or coastal target ranges have the potential to impact marine mammals. Actions that constitute harassment or killing of marine mammals are prohibited by the Marine Mammal Protection Act. In addition, because marine mammals are often highly visible and can attract considerable public attention, damage to these resources could result in negative publicity for the Air Force, possibly leading to closure of ocean or coastal range areas. To avoid such impacts, proposed ocean or coastal target areas should be evaluated for the possible presence of permanent or transient populations of marine mammals. If such populations are present, then the area should not be used, or mission parameters should be modified to avoid impacts to marine mammals. Such potential impacts should be evaluated as part of the NEPA review process.

Thirteen areas in the United States have been designated as national marine sanctuaries under the Marine Protection, Research, and Sanctuaries Act. Actions that could damage marine resources are generally prohibited in the sanctuary areas; however, certain military activities may be permitted. Implementing regulations at 15 CFR Part 922 describe prohibited and permitted activities, including military activities, for each sanctuary. These regulations should be consulted if any portion of a proposed ocean target area lies within the bounds of a designated national marine sanctuary.

4.4 Wildlife Management

Wildlife resources can be damaged by noise, which can disrupt normal feeding, sleeping, and breeding habits; by disruption to habitat areas such as erosion or siltation of streams; and by mortality resulting from direct impacts of munitions. All of these impacts will be less severe for practice munitions such as the BDU-33 than for live munitions. In addition to direct impacts from flight missions, similar impacts can occur as a result of human access to an area for placement of targets, cleanup and retrieval of practice munitions, disposal of UXO, and the like. Construction of roads in particular may have a significant effect on wildlife.

In selecting a target area, the following factors related to wildlife management should be considered:

1) The known presence of wildlife, including migratory or transitory populations that may be present only seasonally.
2) The presence of any significant habitat areas, for example, migratory routes for animals such as elk; areas that provide key wildlife resources such as water, food, or cover; and any known breeding or bedding areas. Some wildlife species such as deer or elk may congregate during the winter in areas that afford good cover and food sources, and such areas should be identified. Scarce resources, such as water sources in arid areas, will also tend to concentrate wildlife.
3) Recreational use of the area by hunters, birdwatchers, photographers, or others, including the frequency and means of access.

Where significant wildlife resources are present, potential impacts should be documented as part of the NEPA review process, and mitigative measures adopted as appropriate. Mitigative measures may include modifying mission parameters to minimize disruptions to wildlife; selecting target areas to avoid sensitive areas (migration routes, breeding or bedding areas) especially at times when wildlife may be concentrated in these areas; controlling wildlife populations through hunting and trapping; and in some cases, relocating populations of potentially impacted species. For proposed target areas on existing installations, mitigative measures should be consistent with the installation's cooperative agreements with the state fish and wildlife agency and the U.S. Fish and Wildlife Service, and where applicable, with the installation's fish and wildlife management plan. (Such plans are required as a component of the installation's Integrated Natural Resources Management Plan for sites that have suitable habitat for conserving and managing fish and wildlife, per AFI 32-7064.)

Chapter

5

Plants

SUSTAINABILITY MATRIX

5. Plants

5.1 Threatened and Endangered Species

5.1.a. Has the range area been evaluated for threatened or endangered species and can potential impacts be avoided?

Required by law, the area must be evaluated for the presence of federal and state listed T&E species. Coordination must take place with the local U.S. Fish and Wildlife Service.

Yes ➡ **Continue to 5.2.a**

No ➡ Can a variance or mitigative measures be applied?

Relocate target area or upon consultation with USDA, if a target area is allowed, provide adequate buffer areas from species of concern.

Yes ➡ **Continue to 5.2.a**

No ➡ Site is unsatisfactory

5.2 Vegetation Management

5.2.a. Has the target area natural vegetation been evaluated for impact on mission?

Vegetation in the target area should be managed to the extent that operations can take place. Vegetation can be beneficial in controlling erosion.

Yes ➡ **Continue to 5.2.b**

No ➡ Can a variance or mitigative measures be applied?

Ensure the use of non-native plants are minimized in order to prevent problems with invasive species and adverse impacts on local or native flora.

Yes ➡ **Continue to 5.2.b**

No ➡ Go to Risk Management Considerations at end of matrix.

5.2.b. Is vegetation adequate to meet mission requirements?

Some training missions may require enhanced vegetation for tactical cover.

Yes ➡ **Continue to 5.3.a**

No ➡ Can a variance or mitigative measures be applied?

Ensure the use of non-native plants is minimized in order to prevent problems with invasive species and adverse impacts on local or native flora.

Yes ➡ **Enhancement required Continue to 5.3.a**

No ➡ **Continue to 5.3.a**

5.3 Fire Controls

5.3.a. Have fire controls been considered?

Vegetation should be managed to minimize fire hazards.

Yes ➡ **Continue to 6.1.a**

No ➡ Can a variance or mitigative measures be applied?

Consider fire breaks or other vegetation controls in design and O&M. Adjust to use CXU-series cartridges.

Yes ➡ **Continue to 6.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

Plants

5. Background

Plant life at a target area must be considered both in terms of environmental protection (safeguarding threatened or endangered species, maintaining wildlife habitat, preventing fire and erosion), and in relation to possible mission impacts. Vegetative cover that is too dense or too sparse may limit the usability of a site for some types of missions, and may require enhancement or clearing. Mission and range maintenance safety can be affected by fires caused by poor vegetation management practices. Vegetation management practices need to be consistent with both mission needs and environmental protection goals.

5.1 Threatened and Endangered Species

The Endangered Species Act prohibits actions that jeopardize the continued existence of an endangered or threatened species (in this case plants), or that result in destruction or adverse modification of critical habitat areas. In addition to the threatened and endangered species listed in federal regulations at 50 CFR Part 17, states may maintain separate lists of threatened and endangered species that are protected under state law.

As with wildlife, the presence of threatened or endangered plant species in a proposed target area, or the overlap of a proposed target area with a species' critical habitat, may render that area unusable for target purposes, or may require the implementation of mitigative measures. For threatened or endangered plant species, mitigative measures would typically include careful delineation of the areas occupied by listed species, including critical habitat areas, and may include exclusion of such areas from use as target areas.

Consultation with the U.S. Fish and Wildlife Service is required for actions that may affect a listed species, and should be undertaken early in the site selection process, ideally in concert with the review process required under NEPA. For proposed target areas that are within existing Air Force installations, the installation's inventory of threatened and endangered species (required by AFI 32-7064, *Integrated Natural Resources Management*), should be consulted to identify the possible presence of listed species within the target area. A biological assessment may need to be performed if there are insufficient data concerning the presence of threatened or endangered species. Detailed steps for evaluating possible impacts to listed species are described in Attachment 3 to AFI 32-7064.

5.2 Vegetation Management

Naturally occurring vegetation in a prospective target area should be evaluated to ensure it supports mission requirements. The height, density, and type of vegetation should not interfere with the missions. Otherwise, clearing or thinning of vegetation may be needed. Vegetation should provide adequate tactical cover if required by the mission; if not, additional planting may need to be considered. Vegetation should also be adequate to control erosion, especially in hilly terrain. Unvegetated or sparsely vegetated sites should not be used without first

establishing appropriate plant cover (some locations such as deserts may not require vegetation cover). However, the need for extensive clearing or planting should be evaluated in light of available funding and time constraints.

If additional plantings are needed, the use of native plants is strongly preferred. Non-native or invasive species can disrupt local ecosystems and make subsequent vegetation management more difficult. For example, some non-native species may be poorly adapted to local conditions and have low survivability without enhanced maintenance efforts such as irrigation or pest control. Other non-native species may out-compete and displace native flora, resulting in a loss of biodiversity and degraded wildlife habitat. The presence of non-native species with high water needs can impact local water resources. Removal of non-native species can often be difficult and expensive once they are established. Note that identification of native and non-native species can be difficult. Different species may superficially resemble each other (e.g., sugar maple and Norway maple). Many commonly planted varieties of lawn grasses and ornamental trees may be abundant in an area, but are not necessarily native. The state department of natural resources or agricultural extension agent can provide information on native species that are best adapted to a particular locale.

Environmental impacts to vegetation should also be evaluated as part of the NEPA review process. Impacts to vegetation may occur due to damage from direct impact of the BDU-33 as well as from the construction of roads in target areas. Some impacts may be indirect or become apparent only over time. For example, clearing vegetation to meet mission needs may cause increased erosion and render soil conditions unsuitable for remaining vegetation. Extensive road construction in steep terrain can lead to erosion and landslides, which further damage the environment and may render the area unsuitable for mission requirements. For prospective target sites on existing installations, vegetation management practices should be consistent with the forest management plan and other elements of the installation's Integrated Natural Resources Management Plan required by AFI 32-7064. Use of heavy vehicles off of established roads within clearance zones may further contribute to the vegetation management problem.

5.3 Fire Controls

Uncontrolled fires in target areas can result in a number of serious consequences. Fires can adversely affect mission safety since they present serious hazards to personnel both on the ground and in nearby airspace. Uncontrolled fires can cause significant environmental damage, and may limit the future usability of the target area. Fires in target areas can spread and damage or destroy other facilities, and can be costly to fight. In target areas, fires can be started from natural sources (lightning), from human activities (campfires, cigarettes, vehicles), and from heat and sparks generated from BDU-33 impacts. Vegetation in target areas needs to be managed so that fire risks are minimized.

Target areas should be carefully evaluated for fire hazards, especially during dry and/or windy weather conditions. The risk of fire is much higher when extended dry conditions have resulted in low moisture levels in vegetation and surface

soils. This may occur on a regular seasonal basis in some areas. Fire hazards include not only flammable materials such as brush and dry grass, but also could result from the explosion of a BDU-33 spotting charge. During potential high fire periods it may be possible to use CXU spotting charges that produce "cold smoke" as an alternative to the MK4 series cartridge.

Personnel who access target areas should be aware of fire hazards and prevention requirements, and should exercise particular care with regard to smoking, open fires, and vehicle use. (Fires can start when combustible materials, such as dry grass, come into contact with hot exhaust pipes or engine surfaces.) Fuel sources such as brush piles from vegetation clearing activities or timber slash from logging activities should be promptly removed and not allowed to accumulate or dry out. Prescribed burning should be used as appropriate to limit the buildup of dead vegetation. Requirements and safeguards for prescribed burning are defined in AFI 32-7064, Section 8. The judicious placement of fire breaks should be considered, but in accordance with the requirements of AFI 32-7064, their use and creation should be minimized. Where fire breaks are needed, they should be maintained to accommodate multiple uses as logging or access roads, hiking trails, or wildlife food plots.

Chapter

6

Land Resources

6. Land Resources

6.1 Open Space/Buffer Zones

6.1.a. Are adequate buffer zones available?

Buffer zones enhance mission safety, security, and natural resources.

Yes ➡ **Continue to 6.2.a**

No ➡ Can a variance or mitigative measures be applied?

Buffer areas may be improved by enhancing with engineering controls.

Yes ➡ **Continue to 6.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

6.2 Exposure to UXO

6.2.a. Have safe separation distances been established between potential UXO areas and the public?

Target areas should be surrounded by adequate open space/buffer areas to ensure security and provide for explosive safety. Buffer zones provide a safety area from sensitive receptors (e.g., schools, homes, hospitals). (Reference applicable safety regulations.)

Yes ➡ **Continue to 6.2.b**

No ➡ Can a variance or mitigative measures be applied?

No part of the weapon safety footprint should leave government-controlled areas.

Yes ➡ **Continue to 6.2.b**

No ➡ Go to Risk Management Considerations at end of matrix.

6.2.b. Are sensitive receptors adequately protected from UXO?

Schools, homes, and hospitals should be located a safe distance from areas potentially containing UXO.

Yes ➡ **Continue to 6.3.a**

No ➡ Can a variance or mitigative measures be applied?

No part of the weapon safety footprint should leave government-controlled areas.

Yes ➡ **Continue to 6.3.a**

No ➡ Site is unsatisfactory

6.3 Recreation

6.3.a. Have safety and security of nearby recreational activities been considered?

During specific times of the year, certain areas of the range or nearby properties could be opened to the public for hunting, fishing, hiking, swimming, and biking. Safety and security must be evaluated and impacts on these activities considered ahead of time.

Yes ➡ **Continue to 6.4.a**

No ➡ Can a variance or mitigative measures be applied?

Commanders must understand the liabilities associated with recreational activities and these activities should be weighed against operational requirements.

Yes ➡ **Continue to 6.4.a**

No ➡ Go to Risk Management Considerations at end of matrix.

6.4 Agriculture/Compatible Use

6.4.a. Are targets located away from Prime and Unique Farmlands?

Proposed target areas should be evaluated for proximity to areas designated as Prime and Unique Farmland by the U.S. Department of Agriculture (USDA).

Yes ➡ Continue to 6.4.b

No ➡ Can a variance or mitigative measures be applied?

Prime and Unique Farmlands should be avoided to the extent possible. If no other alternatives are available, coordination with USDA is required prior to impacting the area.

Yes ➡ Continue to 6.4.b

No ➡ Site is unsatisfactory

6.4.b. Have range areas been evaluated for free-range practices?

It may be appropriate to allow free-range use for domesticated animals (e.g., grazing).

Yes ➡ Continue to 6.4.c

No ➡ Can a variance or mitigative measures be applied?

Appropriate agreements with the Bureau of Land Management must be in place prior to land use.

Yes ➡ Continue to 6.4.c

No ➡ Do not allow free-range activities.

6.4.c. Have range areas been evaluated for compatible agriculture uses?

Consideration should be given to proposed range areas for potential planting and harvesting practices. Proper forestry practices should be implemented when clear cutting areas.

Yes ➡ Continue to 6.4.d

No ➡ Can a variance or mitigative measures be applied?

Clear cutting of an area or winter tilling of soil may cause unwanted soil erosion and sedimentation problems.

Yes ➡ Continue to 6.4.d

No ➡ Do not allow agriculture activities.

6.4.d. Have range areas been evaluated for compatible mining/energy development uses?

Consideration should be given to proposed range areas for potential mining or energy development (e.g., drilling) activities.

Yes ➡ Continue to 6.5.a

No ➡ Can a variance or mitigative measures be applied?

Ensure activities are compatible with mission requirements and do not cause adverse environmental impacts. Coordination with Department of Interior (DOI) is required prior to the initiation of mining activities.

Yes ➡ Continue to 6.5.a

No ➡ Do not allow mining or energy development activities.

SUSTAINABILITY MATRIX

6.5 Residential

6.5.a. Have current and potential residential areas been identified and evaluated for impacts on mission requirements?

Targets should be located a safe distance from residential areas or potential residential developments.

Yes ➡ Continue to 6.5.b

No ➡ Can a variance or mitigative measures be applied?

Early public participation during design and siting process is highly recommended. Additionally, government agencies should actively participate in zoning and future area development plans.

Yes ➡ Continue to 6.5.b

No ➡ Go to Risk Management Considerations at end of matrix.

6.5.b. Have new sortie routes been evaluated for impacts to residential areas?

Aircraft en route to or from the range could adversely impact residential areas.

Yes ➡ Continue to 6.6.a

No ➡ Can a variance or mitigative measures be applied?

Consult with local government/planning commissions to ensure long-term viability of critical airspace. (Reference applicable AFI Regulations.)

Yes ➡ Continue to 6.6.a

No ➡ Go to Risk Management Considerations at end of matrix.

6.6 Industrial/Commercial Property

6.6.a. Are targets a safe distance from industrial areas?

Targets should be located a safe distance from industrial areas or potential commercial developments.

Yes ➡ Continue to 7.1.a

No ➡ Can a variance or mitigative measures be applied?

Early public participation during the design and siting process is highly recommended. Additionally, government agencies should actively participate in zoning and future area development plans.

Yes ➡ Continue to 7.1.a

No ➡ Go to Risk Management Considerations at end of matrix.

Land Resources

6. Background

Effective stewardship of land resources requires consideration of the multiple uses (and potential uses) of the land in question as well as other nearby areas. Safety, security, and completion of the military mission are paramount, but the range siting process also must consider other factors, including protection of the environment and the maintenance of good community relations.

The development of a sound integrated natural resource management plan (INRMP) is integral to the success of the military mission, and it incorporates many of the items discussed in this chapter. This plan, as required by the Sikes Act, DODI 4715.3, *Environmental Conservation Program*, and AFI 32-7064, *Integrated Natural Resource Management*, addresses the management of natural resources on Air Force properties to ensure continued access to land and air space required to accomplish the mission.

6.1 Open Space/Buffer Zones

Range areas should be large enough to allow adequate buffer zones and open space around target areas. Buffer zones and open space provide the following:

- Enhance mission safety by ensuring that target areas are a safe distance from occupied areas.
- Enhance mission performance by ensuring adequate space for various missions (airspace, land/water areas for weapon safety footprints and maneuver areas).
- Ensure mission security by providing adequate barriers to unauthorized access to target areas.
- Enhance natural resources conservation by providing a safe distance between target areas and critical habitats or other ecologically important areas.
- Provide a visual and noise barrier to reduce the impacts of range operations on nearby communities as well as other Air Force facilities and operations.

The size and orientation of buffer zones or open space will be dictated primarily by weapons safety footprints and operational requirements. Buffer areas must be large enough to ensure that weapons safety footprints remain a safe distance from occupied or restricted ecologically sensitive areas. The amount of open space needed for construction and operation will vary depending on the type of drops planned for the range. Open space should be considered part of the buffer/security area that surrounds the perimeter of the target area and the

range. Open space is critical to the safe disposal of UXO and clearance operations.

The designation of buffer zones and open space should take into account current and planned future land uses in the area. This will require interface with local community leaders, planners, and zoning boards during the planning process.

By providing additional distance between populated areas and/or ground access points, buffer zones and open space areas enhance mission security by reducing the likelihood of unauthorized access to the target areas. Fencing and other security measures should also be provided as appropriate. For both safety and security purposes, recreational activities (e.g., hunting, fishing, wood gathering, etc.) should not be allowed in areas designated as buffer zones or open space during weapons delivery missions. This may require additional publicity among local communities if such areas have been commonly used for recreational purposes in the past.

Buffer zones may be advisable around any critical habitat areas to prevent inadvertent impacts to threatened or endangered species, as well as around any other ecologically important areas such as wetlands or estuaries. Vegetated buffer zones should also be established along waterways such as streams, rivers, lakes, and ponds in order to prevent excessive siltation or contamination of these resources due to runoff from the target areas. In all cases, the size of environmental buffer zones should be adequate to protect the resources of concern (listed species, habitat areas, water resources) from impacts originating in the target areas. Consultation with resource conservation professionals (such as the state department of natural resources) may be helpful in establishing the desired size and location of environmental buffer zones. (This should be covered in the EIAP assessment.)

Buffer zones and open space areas should be vegetated to prevent erosion and to retard runoff from target areas. Where already existing, forested areas provide additional noise and visual barriers from range operations. However, thickly wooded areas may make maintaining site security more difficult. If enhancement of existing buffer zone vegetation is needed, native species should be selected to minimize maintenance requirements and ecological impacts. Similarly, if clearing or thinning of vegetation is needed, these activities should be conducted in the least intrusive manner possible so that remaining resources are preserved. If not carefully planned, the construction of logging roads and cutting timber or clearing brush can create severe erosion that results in widespread resource degradation as well as other hazards, such as landslides.

6.2 Exposure to UXO

The presence of UXO can be expected on any target range where munitions are used. UXO may present an environmental hazard as well as a danger to personnel, since explosives are often composed of hazardous materials that may leak or leach out of cracked or damaged casings. In view of these hazards, the planning and placement of target ranges should take into account the expected presence of UXO.

Surrounding the target area with adequate open space and buffer zone areas will help ensure protection from UXO hazards. Target area locations and the type(s) of ordnance used must be evaluated to ensure that weapons safety footprints remain entirely within the boundaries of government-controlled land.

Where UXO hazards are anticipated, particular attention must be given to securing these areas from public access, and ensuring a safe separation distance from sensitive locations such as schools, hospitals, and residential areas. Since the presence of UXO within an area may render it permanently off-limits to the public, community officials and planning/zoning boards should be notified of this issue during the site selection and planning process.

Additional guidance and requirements for the management of property containing UXO are defined in DODD 6055.9-STD *The Explosive Safety Standard*, DODD 4715.11, *Environmental and Explosive Safety Management on Department of Defense Active and Inactive Ranges within the United States,* Air Force Manual 91-201, *Explosives Safety Standards* (Chapter 6, Real Property Contaminated With Ammunition and Explosives), and AFI 32-9004, *Disposal of Real Property* (Attachment to A2.16.2, Section A2.16, Hazardous Ordnance Contaminated Land).

6.3 Recreation

In some cases, the areas used for ranges may have historically been used for recreational purposes. A great deal of publicity must be done to make the public aware of the change to the land use. Public access to designated portions of a range or other nearby areas may be allowed for hunting, fishing, camping, swimming, hiking, and biking during specific times of the year. AFI 32-7064, *Integrated Natural Resources Management*, and Air Force Pamphlet 32-1010, *Land Use Planning*, encourage multiple uses of Air Force properties that are consistent with the military mission. Allowing public use of Air Force lands assists in maintaining good public relations, and activities such as hunting and trapping can assist in controlling populations of game animals. Morale can be enhanced when land is available for recreational use by service members. However, commanders must understand the liabilities associated with such activities and the controls need to ensure these activities are conducted safely and securely.

Liabilities associated with recreational use of Air Force property can include the risk of death or injury, either as a result of accidents (falls, drowning, hunting accidents) or through accidentally or deliberately coming into contact with military equipment such as target items or UXO. Mission security can be compromised if public access is provided (or can be gained) to sensitive areas. Personnel can be injured and/or security compromised if civilian-access areas overlap areas where military training exercises are being conducted. Careless use of natural areas can degrade or damage natural resources. Fires started by careless use can damage both natural resources and Air Force facilities.

Air Force liabilities can be minimized by ensuring that allowed activities and available access to range areas are appropriate given the hazards likely to be present. Public access must be limited to times and areas that will not interfere with the military mission or installation security, will not pose a safety risk to the

public, and will not harm natural resources. Activities that are inherently more dangerous (e.g., rock climbing, skiing) and/or have greater environmental impacts (e.g., snowmobiling, use of all-terrain vehicles) should be more carefully controlled.

One means of doing this is through a permit system, which can be used to regulate the number of individuals allowed access, the type of activities that are permitted, and the areas to which access is granted. As a condition of obtaining a permit, individuals desiring access may be required to attend a briefing or familiarization session to ensure they are familiar with installation-specific requirements, including safety requirements, off-limits areas, and protection of environmental resources. For activities such as hunting or extended back-country camping, the permitting process can be used to ensure that applicants have the proper experience and training to conduct these activities safely. Legal and Public Affairs review of such programs are a must.

6.4 Agriculture/Compatible Use

In August 1980, the Council on Environmental Quality required that the use of Prime and Unique Farmlands be evaluated in all Environmental Impact Statements and Environmental Assessments. These lands are designated by the U.S. Department of Agriculture (USDA). In general, target areas should be located away from Prime and Unique Farmlands, with adequate buffer zones and open space as described above. Alternatives to taking prime and unique farmland should be evaluated and documented as required by the National Environmental Policy Act (NEPA). If other alternatives are not deemed feasible, then coordination with USDA is required before impacting these areas.

Use of Air Force target ranges for free-range purposes (e.g., grazing of cattle or sheep) can complement the range management program. Other agricultural uses on or near range areas may also be allowed. Procedures for managing grazing and agricultural outleasing programs are described in AFI 32-7064, *Integrated Natural Resources Management.* Users must determine the suitability and availability of grazing and agricultural lands in accordance with this instruction. Grazing programs on Department of the Interior lands withdrawn for Air Force uses are generally the responsibility of the Bureau of Land Management. In all cases, the user must ensure the appropriate agreements are in place to maximize shared use of the range in accordance with the BLM Resource Management Plan. The agreement will ensure shared use does not adversely affect range operations, describe procedures to ensure public safety, and document agreements and agency responsibilities for the shared use. This information should be documented in the Integrated Natural Resources Management Plan. Rangeland and agricultural practices should be protective of the environment. In particular, the application of fertilizers, pesticides, and herbicides should be limited and carefully managed. Soil cultivation practices should not allow erosion of soil. Free-range areas must be protected from overgrazing, and measures taken to prevent damage to streambeds.

Forestry operations, including the harvest and sale of forest products, can also be compatible with range management goals when thinning or clearing of forested

areas is needed. Such activities must be carried out in accordance with the requirements of AFI 32-7064, *Integrated Natural Resources Management*, and local government codes, and must conform to sound environmental management and land use practices. In particular, clear cutting and construction of logging roads can cause unwanted erosion of soil and siltation of waterways.

Consideration should also be given to the use of proposed range areas for mineral exploration and extraction (including oil and gas drilling). These activities must be carefully evaluated since they can require the construction of fixed installations (such as mine shafts and structures, or oil/gas wells) that may limit the future use of such areas for military purposes. Mining and mineral/energy source extraction activities can also have significant environmental impacts, and may require extensive restoration efforts. Mining or similar activities must be compatible with mission and safety requirements and resource management programs, and must be carefully planned to avoid adverse environmental impacts. Consultation with the U.S. Department of Interior is required prior to initiating mining activities on government-owned land.

6.5 Residential

Target areas should be located an appropriate distance from residential areas. This distance should be based not only on safety concerns (including weapon safety footprint, buffer zones, and open space), but also on the potential for noise disturbances resulting from aircraft overflights and weapons detonations. The minimum allowable distance from residential areas will depend on the types of missions and munitions planned for the range, the topography, and vegetation. Mountainous and heavily wooded areas provide more effective visual and sound buffers between the range and residential areas than open, flat land.

Noise from aircraft en route to and from target areas can also adversely affect residential areas, particularly at night. Entry and exit routes as well as the target areas themselves should be an appropriate and safe distance from residential areas. Local government and regional planning commissions should be consulted to ensure the long-term viability of critical airspace in light of both current and planned development of the area.

The range siting process must consider not only existing residential developments, but also potential future developments. Close coordination with local and regional planning boards and other state, county, or local government bodies responsible for land use planning is essential. The Air Force should seek to actively participate in zoning and future land use planning activities. Public relations efforts should also be conducted to advise local residents of the pending development of a bombing range, and opportunities provided for public participation and input. Public participation activities are required as part of the NEPA review process, and must be factored into decisionmaking. Such efforts early in the planning process can help to avoid more serious community relations problems later on.

6.6 Industrial/Commercial Property

As with residential properties, target areas should also be located an appropriate distance from industrial and commercial areas. The primary considerations are safety (including weapon safety footprint, buffer zones, and open space) and protection from noise disturbances. In addition, commercial or industrial facilities with stacks, radio towers, or other tall structures may themselves present a hazard to low-flying aircraft.

Local government and regional planning commissions should be consulted concerning both current and planned commercial/industrial developments in the area, including potential airspace restrictions around existing or planned industrial facilities. The Air Force should seek to actively participate in zoning and future land use planning activities. Owners of commercial/industrial facilities should be included in community outreach and public participation efforts.

Chapter

7

Water Resources

7. Water Resources

7.1 Surface

7.1.a. Are targets located away from surface water?

If mission requirements dictate the need for surface water, environmental controls should be implemented to avoid potential adverse environmental impacts.

Yes ➡ Continue to 7.1.b

No ➡ Can a variance or mitigative measures be applied?

Baseline documentation of surface waters and floodplain conditions should be evaluated prior to design and siting.

Yes ➡ Continue to 7.1.b

No ➡ Go to Risk Management Considerations at end of matrix.

7.1.b. Are targets located away from wetlands?

Baseline documentation of wetlands should be evaluated prior to design and siting.

Yes ➡ Continue to 7.1.c

No ➡ Can a variance or mitigative measures be applied?

If the range will include a jurisdictional wetland, coordination with the Army Corps of Engineers must take place. Notice of floodplain/wetland involvement must be published in the Federal Register prior to the commencement of activities.

Yes ➡ Continue to 7.1.c

No ➡ Site is unsatisfactory

7.1.c. Are targets sited to not permit UXO to contaminate local surface waters?

Munitions dropped into nearby surface waters could lead to contamination issues and UXO in deeper water.

Yes ➡ Continue to 7.2.a

No ➡ Can a variance or mitigative measures be applied?

If mission requirements include surface water target areas, then implement a periodic monitoring program.

Yes ➡ Continue to 7.2.a

No ➡ Go to Risk Management Considerations at end of matrix.

7.2 Drainage

7.2.a. Are proposed target sites located to avoid contamination (e.g., UXO, debris, and chemical constituents) of local surface waters?

Improper drainage could result in the creation of standing/surface waters, and potential sources of contamination that could migrate off-site. For example, do not site the target in an arroyo.

Yes ➡ Continue to 7.3.a

No ➡ Can a variance or mitigative measures be applied?

If mission requirements include surface water target areas, then implement a periodic monitoring program (potential expenditure of resources).

Yes ➡ Continue to 7.3.a

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

7.3 Groundwater

7.3.a. Are targets sited away from areas containing high groundwater levels?

Siting a range in the area of shallow groundwater increases the risk of on-site and off-site groundwater contamination.

Yes ➡ Continue to 7.3.b

No ➡ Can a variance or mitigative measures be applied?

If groundwater is present, implement a periodic monitoring program.

Yes ➡ Continue to 7.3.b

No ➡ Go to Risk Management Considerations at end of matrix.

7.3.b. Are targets sited away from sole-source aquifers?

Site must be evaluated for the presence of sole-source aquifers.

Yes ➡ Continue to 7.4.a

No ➡ Can a variance or mitigative measures be applied?

Avoid areas overlying sole-source aquifers. If unavoidable, a periodic monitoring program may be neccessary. In addition, engineering controls could be implemented to limit penetration of ordnance and other devices.

Yes ➡ Continue to 7.4.a

No ➡ Go to Risk Management Considerations at end of matrix.

7.4 Stormwater

7.4.a. Has stormwater runoff from the proposed target area been analyzed to determine whether permits may be required?

Target area may require a National Pollutant Discharge Elimination System (NPDES) permit.

Yes ➡ Continue to 8.1.a

No ➡ Can a variance or mitigative measures be applied?

If the target area requires modification to the hydrogeology, then a NPDES construction permit may be required.

Yes ➡ Continue to 8.1.a

No ➡ Go to Risk Management Considerations at end of matrix.

Water Resources

7. Background

Military training activities can adversely affect surface water, drainage, wetlands, groundwater, and stormwater runoff within the target area. Care must be taken during the planning and target selection stages to mitigate these effects. The discussions in this chapter should all be covered under the appropriate NEPA document. For a new property acquisition these items would be covered in the Environmental Baseline Survey (EBS).

7.1 Surface

Surface water bodies include streams, ponds, lakes, large water bodies (seas, oceans), and wetlands. The primary risk associated with target areas located proximal to surface water bodies is the potential for adverse environmental impacts to human health as well as flora and fauna.

a. It is important to evaluate the proximity of the target area to local surface water bodies. If mission requirements dictate the need for surface water, environmental controls must be implemented to avoid potential adverse environmental impacts. Baseline documentation of surface waters and floodplain conditions should be evaluated prior to design and siting. Depending on the region of the country, the presence of surface water may increase BASH potential. In addition it could result in Migratory Bird Act issues.

   Federal regulations pertaining to activities that have the potential to impact surface waters are listed below. State and local regulations/guidelines should also be considered.

   - Federal Safe Drinking Water Act, 40CFR141.11-12, 141.61-62.
   - National Recommended Water Quality Criteria published as guidance in adopting water quality standards pursuant to Section 303(c) of the Clean Water Act, 40CFR131, revised criteria from 63FR67548 of 7 December 1998.
   - Clean Water Act (CWA) – Surface water quality criteria (CWA Section 303(c), 40CFR131).
   - Coastal Zone Management Act (CZMA) (16 USC 1451, et seq.).
   - Executive Order 11988 – Floodplain Management.

   The primary risk associated with target areas located proximal to surface water bodies is the potential for adverse environmental impacts.

b. Baseline documentation of wetlands should be evaluated prior to design and siting. If the range will include a jurisdictional wetland, coordination

with the U.S. Army Corps of Engineers must occur. Notice of floodplain/wetland involvement must be published in the Federal Register prior to commencement of activities.

Regulations pertaining to activities that have the potential to impact surface waters are listed below. In some cases, pertinent local laws exist that must be evaluated.

- CZMA (16 USC 1451, et seq.).
- Executive Order 11988 – Protection of Wetlands.
- Endangered Species Act (16 USC 1531 et seq., 33 CFR 320-330, 40 CFR 6.302, 50 CFR 27, 50 CFR 200, 50 CFR 402.01, .02).

No specific risks associated with siting target areas in wetlands have been identified. However, potentially adverse environmental impacts of testing in wetlands must be considered.

c. Munitions dropped into nearby surface waters could lead to constituent contamination issues and migration of underwater UXO. Upon closure of the water target or range UXO, clearance may become an issue. Because clearance of UXO in water can be very time consuming and costly, and requires specially certified Navy EOD personnel, it is not recommended. In addition, the impacts of UXO and their constituents on marine plants and animals are not fully understood. If mission requirements include surface water target areas, coordinate closely with local regulatory agencies and other environmental stakeholders to determine potential long-range impacts. The implementation of a sound baseline and periodic monitoring program is highly recommended.

7.2 Drainage

Improper drainage could result in the creation of standing/surface waters, wetlands, and potential sources of contamination that could migrate off-site. For example, targets should not be sited in an arroyo. If mission requirements include surface water target areas, then implement a periodic monitoring program and establish an environmental baseline.

Risks associated with poor drainage include potentially adverse environmental impacts and significant impacts to the operational schedule and budget if a monitoring program is required.

7.3 Groundwater

Groundwater resources are often difficult to fully characterize and can present a challenge to designers and engineers. However, since groundwater is a highly valued resource, care must be taken to best determine the actual conditions so that precautions protecting groundwater can be taken.

a. Shallow Groundwater - Siting a range in the area of shallow groundwater increases the risk of on-site and off-site groundwater contamination. If

pathways to groundwater are present, implement a periodic monitoring program. The primary regulations governing use of these waters are presented in the Federal Safe Drinking Water Act, 40 CFR 141.11-12, 141.61-62. Targets located in areas of shallow groundwater may significantly affect the operational schedule and budget because of the need to perform baseline and periodic monitoring of the shallow groundwater. It may be prudent to evaluate various engineering controls to reduce potential impacts to groundwater.

b. The site must be evaluated for the presence of a sole-source aquifer. Avoid areas overlying sole-source aquifers. It is not recommended that targets be sited in these areas. If it is unavoidable, a baseline and periodic monitoring program must be established. Federal Safe Drinking Water Act, 40 CFR 141 is the primary regulatory driver. Risk associated with this includes not only the logistic challenges of monitoring and documenting any adverse trends, but also negative public reaction.

7.4 Stormwater

In some cases a target area may require a NPDES permit. For example, if the target preparation area or range residue consolidation points require modification to the hydrogeology, a NPDES construction permit may be necessary. Additionally, siting the target in a floodplain is not advisable. Significant potential exists for damage to target areas during flood events. Regulations governing these actions include the following:

- Federal Safe Drinking Water Act, 40CFR141.11-12, 141.61-62.
- National Recommended Water Quality Criteria published as guidance in adopting water quality standards pursuant to Section 303(c) of the Clean Water Act, 40CFR131, revised criteria from 63FR67548 of 7 December 1998.
- Clean Water Act (CWA) – Surface water quality criteria (CWA Section 303(c), 40CFR131).

Chapter

8

Air Resources

8. Air Resources

8.1 Air Space

8.1.a. Is adequate airspace avaliable to meet mission requirements?

Mission Training Routes to and from the sortie generation points may need to be established. Airspace volume must be adequate in size to meet mission requirements. There are significant FAA restrictions that may impact airspace use.

Yes ➡ **Continue to 8.2.a**

No ➡ Can a variance or mitigative measures be applied?

Plan for current and future use weapon requirements and coordinate all activities with FAA and local government.

Yes ➡ **Continue to 8.2.a**

No ➡ Site is unsatisfactory

8.2 Munitions Detonation

8.2.a. Has the operation been evaluated for environmental impacts resulting from particulate (dust particles greater than 10 microns) releases?

Nonattainment areas may be subject to Clean Air Act National Ambient Air Quality Standards (NAAQS).

Yes ➡ **Continue to 8.2.b**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 8.2.b**

No ➡ Site is unsatisfactory

8.2.b. Has the operation been evaluated to determine potential releases of gaseous pollutants (e.g., titanium tetrachloride and red phosphorus), trace organics (e.g., smokeless powder), and trace metals (titanium tetrachloride) and odors/noxious fumes (e.g., red phosphorus)?

Some areas may be subject to Clean Air Act NAAQS.

Yes ➡ **Continue to 8.2.c**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 8.2.c**

No ➡ Site is unsatisfactory

8.2.c. Have EPCRA TRI thresholds been accounted for?

TRI Thresholds need to be calculated to determine reporting requirements.

Yes ➡ **Continue to 8.3.a**

No ➡ Can a variance or mitigative measures be applied?

If thresholds exceed reporting requirements, reports must be recorded and generated.

Yes ➡ **Continue to 8.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

8.3 Aircraft Emissions

8.3.a. Have operations been evaluated for impacts resulting from aircraft emissions?

Some areas may be subject to Clean Air Act NAAQS.

Yes ➡ Continue to 8.4.a

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required or adjust operations (e.g., fly earlier in the day).

Yes ➡ Continue to 8.4.a

No ➡ Site is unsatisfactory

8.4 Direction and Dispersion of Emissions

8.4.a. Have soft targets been evaluated for potential particulate dispersion?

Soil conditions may increase the dispersion of particulates and be subject to Clean Air Act NAAQS.

Yes ➡ Continue to 8.4.b

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, or apply engineering controls as required.

Yes ➡ Continue to 8.4.b

No ➡ Site is unsatisfactory

8.4.b. Have wind speed and direction been evaluated for impacts on potential sensitive receptors?

Wind speed and direction may disperse contaminants and impact local/sensitive receptors.

Yes ➡ Continue to 8.4.c

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ Continue to 8.4.c

No ➡ Go to Risk Management Considerations at end of matrix.

8.4.c. Has the terrain been evaluated for its potential to cause inversions?

Inversion conditions may be created in valleys or higher dispersement of emissions may occur in flat areas or desert-like areas.

Yes ➡ Continue to 9.1.a

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required (VFR considerations).

Yes ➡ Continue to 9.1.a

No ➡ Go to Risk Management Considerations at end of matrix.

Air Resources

8. Background

A variety of air pollutants are regulated under different mechanisms of the federal Clean Air Act (CAA). Criteria pollutants are those for which national ambient air quality standards (NAAQS) have been established because of their adverse effects on health and welfare. Criteria pollutants are nitrogen oxides (NO_x); sulfur oxides (SO_x); carbon monoxide (CO); lead; ozone, which is formed by photochemical reactions in the lower atmosphere from volatile organic compounds (VOCs) and NO_x; and PM, or particulate matter. PM-10, or particles smaller than 10 micrometers (μm), are regulated; previously, total suspended particulates (TSP) were regulated; new regulations will regulate PM-2.5, or particles smaller than 2.5 μm. In addition, 188 listed hazardous air pollutants (HAPs) are subject to emission regulations for specific categories of new and existing sources. Similarly, emissions of specified criteria pollutants from new sources of certain source categories may be regulated. However, the use of munitions and operation of aircraft are not regulated by these emission standards.

Facilities as a whole and emission changes at facilities may be required to apply air pollution emission controls, conduct ambient air quality impact modeling, or obtain emissions offsets. The trigger levels and requirements of these regulations vary depending on whether or not the area is attaining the NAAQS and may vary to some degree from state to state. Emissions of mobile sources such as aircraft and fugitive sources (not emitted from a smoke stack) such as from explosion of emissions and entrained dust are often not subject to these new source review regulations.

A bombing range would be expected to generate several classes of air pollutants. Gaseous criteria pollutants, e.g., NO_x, SO_x, and CO, would be formed from explosion and combustion of nitrogen, sulfur, and carbon in the explosives or munitions. ("Thermal" NO_x is also formed from the heating of nitrogen in the air.) VOC, another gaseous criteria pollutant, could result from unburned or partial burned organic matter or from volatilization of organics in unexploded munitions.

PM, measured as TSP, PM-10, or PM-2.5, can result from combustion (soot or ash) or entrained dust. In addition to criteria pollutants, trace organics would be primarily products of incomplete combustion or volatilization products. They may be hazardous, depending on their chemical and physical characteristics and if they are present in sufficient quantities. There is a potential for minor quantities of metals to be released into the air when the spotting charges fire in these types of practice munitions. Wind erosion of UXO or munitions fragments could also generate some, probably insignificant, quantities of metal particles. Metals emissions also may be hazardous.

8.1 Air Space

MTRs to and from the sortie generation points may need to be established. Routing should consider the potential impacts of entrainment of dust. Dust entrainment or disturbance poses a special concern for low-altitude flying by rotary wing aircraft over dry soils without vegetative cover. Routing should consider whether receptors of concern (residences, schools, hospitals, parks, farms, etc.) are located downwind of MTRs. It may be appropriate to curtail or redirect flights during certain weather conditions or wind directions.

Current and future weapon requirements should be considered. All activities should be coordinated with the appropriate state and local government air permitting authorities.

8.2 Munitions Detonation

Detonation of munitions will generate gaseous and particulate emissions from combustion. In addition, the explosion will entrain dust. Dust entrainment will be reduced by use of practice munitions (with small explosive charges), hard targets, moist soils, and ground cover. An additional source of air emissions is foreseen in the explosion of the robust countercharges EOD uses to destroy the UXO. When the BDU-33 fails to function as designed, reliable countercharging is difficult; therefore, a larger countercharge is necessary. UXO could also generate emissions by vaporization of organics or wind erosion of exposed metal casings. Vaporization of organic material in UXO would likely require a leak or crack in containment and would tend to be greater in hotter areas. Wind erosion of exposed casings would be especially likely in sandy areas with lots of windblown dust.

Quantities of emissions are expected to be small; however, siting of a new training range should evaluate the applicability and requirements of new source review for regulated air pollutants. Meteorological conditions, background ambient air quality, and air quality impacts should be monitored and/or evaluated as required. If required, mitigation measures should be taken.

Even if new source review and emission standards do not apply, most jurisdictions have regulations limiting the generation of off-site visible emissions, odors, or fugitive dust. Engineering controls should be evaluated and applied if problems are projected or sufficient complaints are generated.

If emissions of Emergency Preparedness and Community Right-to-Know Act (EPCRA) pollutants are projected, toxic release inventory (TRI) emissions need to be calculated for the entire facility and compared with reporting thresholds to determine reporting requirements. If relevant usage, storage, or emission quantities exceed reporting thresholds, reports must be recorded and generated. TRI emissions must also consider countercharges employed by EOD.

8.3 Aircraft Emissions

Aircraft and other mobile source emissions are regulated at the point of manufacture. Monitoring and repair or adjustment may be required to ensure

emission levels do not exceed standards for the particular model/engine/model year.

The location of receptors of concern or specific site or meteorological conditions may advise curtailing or adjusting operations (e.g., flight paths, flying earlier in the day, refraining from flying in certain wind conditions).

8.4 Direction and Dispersion of Emissions

Site-specific wind speeds and directions should be evaluated for impacts on potential sensitive receptors. Although air quality modeling may not be required by air quality regulations, modeling may be prudent if sensitive receptors are nearby or downwind, or if air quality complaints (e.g., smoke, odors, dust) are received. Engineering controls or operation changes should be applied as required.

Chapter

9

Climate

9. Climate

9.1 Precipitation

9.1.a. Have weather conditions been evaluated for impacts on mission?

Areas of high precipitation may increase the potential for migration of contaminants. Additionally, such areas may impact operation and maintenance activities (e.g., flooding or desert-like conditions).

Yes ➡ **Continue to 9.2.a**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 9.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

9.2 Temperature

9.2.a. Have temperature conditions been evaluated for impacts on mission?

May affect vapor emission rates. Additionally it may impact operation and maintenance activities (e.g., extreme hot or cold).

Yes ➡ **Continue to 9.3.a**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 9.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

9.3 Hazardous Weather Conditions

9.3.a. Have hazardous weather conditions been evaluated for impacts on mission?

Areas prone to hazardous weather conditions may impact mission and O&M (e.g., dust storms, high snowfall, hurricane-prone areas).

Yes ➡ **Continue to 9.4.b**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 9.4.b**

No ➡ Go to Risk Management Considerations at end of matrix.

9.4 Wind

9.4.a. Have wind conditions been evaluated for impacts on mission?

Wind may affect dispersion of emissions and impact O&M activities.

Yes ➡ **Continue to 10.1.a**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 10.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

Climate

9. Background

The climate of a target area can directly impact a pilot's ability to complete a training mission and can directly affect the munitions themselves. Climatic conditions such as extreme temperatures, winds, prevalence of severe weather conditions, and precipitation need to be considered prior to siting a target area. In addition, topographic and vegetation features can create microclimatic zones in an area (e.g., hills and tree lines) that may influence specific target area placement. (*Comprehensive Data Source and Application*, Chapter 2, Section G).

Information on local climate conditions, annual precipitation, and regional weather patterns are available from a variety of sources, including the following:

- National Oceanic and Atmospheric Administration (NOAA)
- Federal Aviation Administration (FAA)
- National Weather Service
- Air Force and DOD Weather Agencies

9.1 Precipitation

Annual rainfall and snowfall characteristics affect mission requirements and target use. Areas that experience heavy annual precipitation can adversely affect sortie generation and target acquisition, thereby limiting useful training opportunities. Such areas can also adversely affect target operations and maintenance activities because of access problems resulting from the wet conditions, and can also impact the natural resources in the area (e.g., increased rates of erosion or sedimentation).

Conversely, arid regions also present limitations. These regions often experience dust storms or have higher fire hazards, which may limit use. In addition, airborne particulates resulting from target use and maintenance present issues in nonattainment areas.

Engineering controls such as drainage enhancements or vegetation management may be used to help minimize certain adverse conditions resulting from excess precipitation. Target areas should also be designed to avoid water ponding in or around the target area, because ponded water presents maintenance and environmental concerns and encourages unwanted vegetation and wildlife.

Generally, maintenance is difficult to perform on targets located in regions that experience high snowfall, especially if the region's summer season is short. Operators often prefer to use the ranges during the summer months when weather conditions are more suitable for training exercises. Conversely, ranges in desert regions experience the opposite conditions. Clearance activities are preferred to be conducted in the winter months when it is cooler, but ranges often host northern units (e.g., "snowbirds") and experience a higher usage. These situations can impact a range maintainer's ability to perform necessary clearance and target reconstruction efforts.

9.2 Temperature

Extreme heat or cold can make performing maintenance activities difficult. Target maintenance activities conducted under these conditions may be subject to lower productivity levels, creating adverse implications for personnel safety. Maintenance and EOD personnel must be monitored for dehydration, hypothermia, and related exposure risks. In addition, support equipment must be able to operate reliably under such conditions.

9.3 Hazardous Weather Conditions

Floods, snow, ice, typhoons/hurricanes, and tornadoes are examples of hazardous weather conditions that may adversely impact a target's usefulness. While such "Acts of God" cannot always be anticipated, there are regions that are prone to such conditions, and it is prudent to examine the potential implications of these conditions on targets and the range in the planning processes to determine the potential for off-site migration of UXO and associated contaminants.

In some regions where hazardous weather conditions are common (e.g., snow or typhoons) engineering controls may be necessary to lessen the impacts resulting from such conditions. Windbreaks, dikes, and snow fences are just a few examples of such control mechanisms. The ultimate goal is to ensure that target recovery can be accomplished efficiently and economically so that mission requirements are minimally impacted.

9.4 Wind

Prevailing wind patterns and intensities should be considered during the design phase. Wind can affect munition dispersion as well as approach tactics. Wind can carry noise, dust, and emissions into areas that may contain sensitive receptors. Additionally, visibility can be a factor in arid regions where dust storms are common.

Engineering and vegetation controls, such as windbreaks, can help alleviate some concerns resulting from adverse wind conditions. In addition, the affects of prevailing winds on range fires will be critical in positioning the fire breaks and other controls necessary to contain unplanned fires.

Chapter

10

Noise and Vibration

10. Noise and Vibration

10.1 Aircraft and Ordnance

10.1.a. Have environmental conditions been evaluated for propagation of noise and vibrations?

Weather can have a considerable impact on the ability of noise to travel. Areas with little wind and very dry climate conditions can carry noise further. Additionally, low cloud cover can magnify noise conditions. In some cases large bodies of water can also act as an amplifier.

Yes ➡ **Continue to 10.2.a**

No ➡ Can a variance or mitigative measures be applied?

Observe the surrounding environment and conduct noise studies at greater distances if conditions warrant.

Yes ➡ **Continue to 10.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

10.2 Fauna

10.2.a. Has consideration been given to the impacts of noise and vibration on local animals?

Noise can impact animal production (e.g., milk, eggs) as well as breeding.

Yes ➡ **Continue to 10.3.a**

No ➡ Can a variance or mitigative measures be applied?

Noise created by munition impact, and aircraft approaches should be evaluated for impact on domesticated animals.

Yes ➡ **Continue to 10.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

10.3 Humans

10.3.a. Has consideration been given to the impacts of noise and vibration on local populations?

Noise can be a nuisance factor in populated areas.

Yes ➡ **Continue to 10.3.b**

No ➡ Can a variance or mitigative measures be applied?

Reference FAA regulations for aircraft operations over populated areas. In addition, consult with local authorities concerning noise ordinances. The RIM supports the MOA Range NOISEMAP to analyze subsonic aircraft noise impact and MicroBNOISE to develop blast noise contours.

Yes ➡ **Continue to 10.3.b**

No ➡ Site is unsatisfactory

10.3.b. Has consideration been given to the impacts of noise and vibration on future development?

Assess the direction of urban growth trends to ensure that urban sprawl does not present a future encroachment issue.

Yes ➡ **Continue to 10.3.c**

No ➡ Can a variance or mitigative measures be applied?

Reference FAA regulations for aircraft operations over populated areas. In addition, consult local authorities concerning noise ordinances. The RIM supports the MOA Range NOISEMAP to analyze subsonic aircraft noise impact and MicroBNOISE to develop blast noise contours. Future uses should be anticipated that might alter size requirements. By working with weapon planners and local developers, future incompatibilities can be minimized. Involve local community leaders, planners, and zoning boards to create easements and buffer zones around the range.

Yes ➡ **Continue to 10.3.c**

No ➡ Go to Risk Management Considerations at end of matrix.

10.3.c. Has consideration been given to the impacts of vibration on infrastructure or other industrial operations?

Vibrations may adversely impact industrial operations.

Yes ➡ **Continue to 10.4.a**

No ➡ Can a variance or mitigative measures be applied?

Avoid sensitive industrial areas (e.g., power plants) and residential or highly populated areas where blast or aircraft vibrations may have negative impacts.

Yes ➡ **Continue to 10.4.a**

No ➡ Go to Risk Management Considerations at end of matrix.

10.4 Terrain

10.4.a. Has consideration been given to the impacts of noise and vibration on local terrain?

Noise and vibrations can affect avalanche and landslide potential.

Yes ➡ **Continue to 11.1.a**

No ➡ Can a variance or mitigative measures be applied?

Engineering controls (e.g., controlled blasting) may be applicable.

Yes ➡ **Continue to 11.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

Noise and Vibration

10. Background

Noise impacts not only humans but animals as well, while vibrations can affect infrastructure or other industrial operations. When considering potential target areas, these aspects must be examined to determine possible adverse effects. Therefore, the noise created by the munition, its drop, and by aircraft approaches and egresses should be evaluated for impact on local communities, domesticated animals (sheep, cattle, birds), marine mammals, and other fauna. Consider noise created by disposal of UXO by countercharge. A final consideration is associated with range residue processing operations, as these operations often require the use of very robust heavy equipment. Such operations would include crushing, cutting, and shearing with heavy equipment.

Regulations governing noise and vibration determinations are presented in the following documents:

- DODI 4165.57 – Air Installations Compatible Use Zones
- AFI 32-7063 – Air Installation Compatible Use Zone Program
- 32 CFR Part 989.32
- FAA Order 5050.4A

10.1 Aircraft and Ordnance

Noise and vibration considerations stem primarily from activities associated with aircraft and munition detonation, especially large numbers of BDU-33s that are gathered for disposal by detonation. In particular, aircraft noise can be generated as a result of overflights or certain training maneuvers. According to FAA studies (Aviation Noise Effects, March 1985), excessive aircraft noise can interfere with speech, cause hearing loss, and adversely affect sleep in humans. It is therefore imperative that all aspects of aircraft- and munition-generated noise be properly addressed in order to minimize adverse physical and legal consequences.

AFI 13-212 Vol. 3, *Safe Range Program Methodology*, can provide further information in identifying potential noise ramifications. The RIM supports the MOA Range NOISEMAP (MR_NMAP) and NOISEMAP programs to analyze subsonic aircraft noise impacts in special-use airspace and restricted areas, and MicroBNOISE to develop blast noise contours for ordnance deliveries.

10.2 Fauna

Excessive noise can adversely affect domesticated, wild, and marine animals. A June 1988 report by the Air Force Engineering Service Agency and the Department of Interior compiled a list of studies documenting the impacts of noise on wildlife. (Effects of Aircraft Noise and Sonic Booms on Domesticated Animals and Wildlife: Bibliographic Abstracts, AFESC TR 88-14).

Target designs should evaluate the types of properties aircraft will use when approaching and leaving range areas. Any changes in these approaches and egresses will also need to be reevaluated if mission requirements change. Excessive noise has been shown to affect the breeding habits of some animals. In addition, there is some concern that high levels of acoustic energy may cause certain species of marine mammals to beach themselves. Areas under such routes should be examined for potential economic and environmental impacts to domesticated animals (e.g., foul, cattle, swine, etc.) and wildlife (e.g., bird populations).

10.3 Humans

Noise is often defined as unwanted sound. With human populations in particular, it is important to understand the levels of acceptable noise. Concepts such as "noise compatibility" and "background noise" are important aspects in determining what level of noise will be acceptable to the exposed populations. Noise compatibility identifies what noise levels are compatible with the area's current use, while background noise is the baseline or existing noise condition.

Both the EPA and FAA have developed several regulations determining safe noise criteria. The following is a partial list of these references:

- 14 CFR 150 Airport Noise Compatibility Planning
- 42 USC 4903 Federal Programs
- 29 USC 47504 Noise Compatibility Programs
- 49 USC 47523 National Aviation Noise Policy

10.4 Terrain

The target area's surrounding environment can also enhance or decrease noise and vibration implications. For example, low cloud cover can magnify noise energy, and arid regions with little wind can carry sound waves farther. Vegetation can help mute noise. Use of natural or existing noise barriers should be considered if noise will be an issue in the surrounding community. Further information on other potential mitigative measures is presented in AFJMAN 32-1090, Noise and Vibration Control.

Chapter

11

Visual Resources

11. Visual Resources

11.1 Scenery

11.1.a. Has the range area been evaluated for negative aesthetic impacts?

Visual resources are a public concern and steps should be taken to reduce changes to the areas visible to the public.

Yes ➡ **Continue to 11.2.a**

No ➡ Can mitigative measures be applied?

Consider leaving untouched buffer surrounding range areas.

Yes ➡ **Continue to 11.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

11.2 Structures

11.2.a. Has the range area been evaluated for aesthetic impacts resulting from mission-related structures?

Large structures can be considered an eyesore (e.g., towers, fencing, above-ground storage tanks).

Yes ➡ **Continue to 11.3.a**

No ➡ Can a variance or mitigative measures be applied?

Consider painting the structure the same color as the surrounding area to camouflage, or other similar architectural enhancements.

Yes ➡ **Continue to 11.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

11.3 Clearcutting/Grading

11.3.a. Have clearcutting or grading activities been considered in their effects on local aesthetics?

The removal of vegetation, especially large tree stands, can create an eyesore if the public has direct eye contact with the area. In addition, major earth-moving operations can also create public issues because the regrading of an area and consequential stripping of vegetation results in unsightly terrain.

Yes ➡ **Continue to 12.1.a**

No ➡ Can a variance or mitigative measures be applied?

During the planning process, consideration should be given to the number of visual changes that will take place in the proposed area. Leave an untouched buffer surrounding range areas.

Yes ➡ **Continue to 12.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

Visual Resources

11. Background

Aesthetics provide a better atmosphere in which to work, and also foster public acceptance of target areas. Historically, bombing ranges have been located away from the public. For safety and convenience, land that was once inaccessible to the general public was used for target areas.

In recent years this has changed as a burgeoning population, as well as modernized platforms and munitions, have put today's range operations closer to the public than ever before. Land surrounding ranges is usually untouched, and thus has a wide variety of appeal to the public for recreational and economic uses. However, the public is encroaching on these once-isolated facilities, and the military must now be concerned with not only the safety and operational constraints of the range, but also with public perception regarding the impact of operations on the range.

NEPA regulations identify aesthetics as one of the factors that must be considered in determining the effects of a project. In addition, Title 23 U.S.C. 109(h) endorses this philosophy and cites that the aesthetic effect of a proposed project must be fully considered.

11.1 Scenery

While not much can or should be done to improve the aesthetics of an impact area, the surrounding buffer area can be used to add visual appeal, and in some cases, visually shield the range. Leaving buffer areas along the range untouched is highly recommended. Not only does this improve the visual aspect of the range, it also provides additional benefits such as noise reduction and erosion control.

In addition, target areas can be enticing to curiosity seekers and those wanting to obtain "souvenirs," which presents considerable safety and liability concerns. Where public lands buffer the range, as much space for natural growth as possible should be allowed. By camouflaging target areas with their natural surroundings, they become less obvious to the public and enhance the overall visual appeal of the area.

11.2 Structures

Large structures on the range can be considered eyesores. Towers, fencing, and even large above-ground storage tanks detract from the landscape. Painting all of the structures in one color that would blend into the surrounding area is one way to camouflage their existence without compromising their integrity. Another way is to plant trees or vegetation that shield the facilities either partially or fully from view. The goal is to maintain functionality while increasing visual appeal wherever possible. In addition, during the planning and design of the range and its facilities, local ordinances dictating architectural or landscaping guidance should be considered.

11.3 Clearcutting/Grading

Major earthmoving can create unsightly terrain and degradation of the land. In addition, clearcutting and grading are expensive in terms of both time and labor. Whenever possible, they should be used for only the bare minimum of land clearance. Surrounding buffer areas should be retained and maintained for visual appeal. Also, areas of scarred earth should be replanted as soon as it is feasible in order to limit environmental concerns (e.g., erosion and sedimentation) as well as restore aesthetics and enable functionality.

Chapter

12

Cultural/ Archaeological Resources

12. Cultural/Archaeological Resources

12.1 Religious/Archaeological

12.1.a. Has the target area been evaluated for impacts to cultural or archaeological resources?

The Archaeological Resources Protection Act and Native American Burial Rights Act require that Federal Agencies evaluate the potential for cultural and archaeological resources on potential locations for construction. Local populations, based on their cultural heritage, may need access to such sites. Additionally, areas larger than the actual archaeological/burial site may be required so as to not interfere with spirit sites.

Yes ➡ **Continue to 12.2.a**

No ➡ Can a variance or mitigative measures be applied?

The mission must be evaluated to ensure safe access and protection of these areas as required.

Yes ➡ **Continue to 12.2.a**

No ➡ Site is unsatisfactory

12.2 Historical

12.2.a. Has the target area been evaluated for impacts to historically important resources?

National Historic Preservation Act (NHPA) requires that federal agencies evaluate the potential of cultural and archaeological resources (e.g., battlefields, National Historic Landmarks) on potential locations for construction.

Yes ➡ **Continue to 13.1.a**

No ➡ Can a variance or mitigative measures be applied?

These resources must be protected against damage or destruction unless properly documented and recorded according to the regulations set forth in the NHPA (Section 106). Must have consultation and coordination with the appropriate agencies (e.g., SHPO, Tribal Leaders).

Yes ➡ **Continue to 13.1.a**

No ➡ Site is unsatisfactory

Cultural/Archaeological Resources

12. Background

Ranges often contain cultural and archaeological artifacts. In 1906, Congress passed the Antiquities Act. The act was intended to prevent looting and vandalism of archaeological sites on public lands. In the 1970s, however, it became apparent that other laws were needed to help ensure the protection of both archaeological and historical sites.

With the passage of the Archaeological Resources Protection Act (ARPA) (1979, amended 1988), the Native American Burial Rights Act, and the National Historic Preservation Act, it is imperative now more than ever that certain guidelines be followed before work can begin on new bombing ranges. Appropriate Air Force guidance is presented in AFI 32-7065, *Cultural Resource Management*. This regulation requires the development of a Cultural Resource Management Plan (CRMP). Meeting the requirements of NEPA will address the issues covered by this chapter.

12.1 Religious/Archaeological

The Archaeological Resources Protection Act of 1979, as amended in 1988, strengthened the penalties for robbing and vandalism of archaeological sites and gave federal agencies responsibility for protection and management of those sites. As a result, whoever controls the land on which the site is situated has direct responsibility for the site itself.

Section 4 of the ARPA "establishes a permitting system through which federal agencies can authorize professional scientific excavation and removal of archaeological resources from their lands." Before that can be done, however, other regulations must be followed. Included in this is Section 14, which requires the federal agency to develop plans for an archaeological survey of all lands under its control, including a survey of lands likely to contain scientifically valuable archaeological resources. The agency must also develop a system of reporting suspected violations of the Act.

The Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) and EO 13175*, Consultation and Coordination with Indian Tribal Governments*, takes ARPA one step further. It requires consultation with "appropriate" Indian tribes prior to intentional excavation, or removal after inadvertent discovery of both human and cultural objects. This means that any indication of Native American artifacts requires complete cessation so the area can be evaluated. Only with the permission of tribal leaders, and a permit from The National Historic Preservation Council, can work resume. An area that contains archaeological resources may be deemed too valuable to be used as a range. Investigation and excavation processes can be lengthy, so wherever possible, another, more appropriate site should be used.

12.2 Historical

The National Historical Preservation Act (NHPA) requires federal agencies to evaluate cultural and historical resources before construction of any type can take place on the site. Section 106, in particular, sets out a strict protocol that must be followed before work can take place. A thorough investigation of the site and approval by the NHPA council must be completed "prior to the approval or the expenditure of any federal funds on the undertaking or prior to the issuance of any license." Evaluation and identification of historic properties are key. If proposed targets fall on those sites, reconsideration of the project area is suggested.

When proposed land is on areas that have religious and cultural attachments, tribal organizations must be consulted. Without their permission, use of land for any purpose is unlawful.

The DOD takes the lead on all matters falling within the boundaries of its bases. Key sources of information can be found at the U.S. Department of the Interior, National Park Service, and the U.S. Department of Energy.

Chapter

13

Socioeconomics

13. Socioeconomics

13.1 Food and Water

13.1.a. Have range activities been evaluated for potential impacts on the local population's subsistence activities?

Range activities may impact the local population's ability to continue subsistence farming, fishing, and other similar activities.

Yes → **Continue to 13.2.a**

No → Can a variance or mitigative measures be applied?

Prior to siting the range/target area, ensure operations will not adversely impact the local population's ability to obtain food and water. In some cases it may be possible to provide access to alternative sources.

Yes → **Continue to 13.2.a**

No → Go to Risk Management Considerations at end of matrix.

13.2. Employment

13.2.a. Have range activities been evaluated for potential impacts on employment opportunities for the local population?

Range activities may have both positive and negative consequences on employment opportunities for local populations. In some cases the operations may be able to provide jobs; in other cases, it may create a situation where businesses choose to relocate.

Yes → **Continue to 13.3.a**

No → Can a variance or mitigative measures be applied?

In some cases negative consequences may be mitigated by providing education/training for alternative employment opportunities.

Yes → **Continue to 13.3.a**

No → Go to Risk Management Considerations at end of matrix.

13.3. Infrastructure

13.3.a. Have range activities been evaluated for potential impacts on public or private infrastructure?

Range construction and operations may impact local utilities or services (e.g., adequate water, power, or waste treatment, telephone).

Yes → **Continue to 13.3.b**

No → Can a variance or mitigative measures be applied?

Evaluate local services and upgrade as necessary. Ensure growth and expansion of services and utilities can meet future requirements.

Yes → **Continue to 13.3.b**

No → Go to Risk Management Considerations at end of matrix.

13.3.b. Have local utilities and services been evaluated for their ability to support range activities?

The ability of local municipalities to provide adequate services, such as roads, snow removal, power, and communication services, must be examined prior to construction.

Yes ➡ **Continue to 13.4.a**

No ➡ Can a variance or mitigative measures be applied?

Evaluate local services and upgrade as necessary. Ensure growth and expansion of services and utilities can meet future requirements.

Yes ➡ **Continue to 13.4.a**

No ➡ Go to Risk Management Considerations at end of matrix.

13.4. Environmental Justice

13.4.a. Have local population and socioeconomic conditions been evaluated?

Certain activities are considered undesirable (e.g., landfill, industrial). Care must be taken to not site such activities in an area of low-income or minority population that would bear a disproportionate number of adverse health, economic, and environmental effects.

Yes ➡ **Continue to 14.1.a**

No ➡ Can a variance or mitigative measures be applied?

Ensure that areas housing low-income or minority populations are not "under consideration" when siting or designing a range/target area (REF EO 12989).

Yes ➡ **Continue to 14.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

Socioeconomics

13. Background

Socioeconomics covers a broad range of topics concerning the local economic environment. Aspects include the ability of the local population to support itself and the implications that may result from range activities, as well as impacts to resources that the local community depends upon such as utilities, agriculture, and transportation systems.

The full implication of the military's impact on the local socioeconomic environment can realistically only be evaluated in concert with local officials and populations. One mechanism for developing this line of communication is by establishing Advisory Boards or Cooperatives that include community leaders and interested stakeholders. Obviously, smaller, more-isolated communities will experience a higher impact than sizable towns or cities. And with certain populations, such as Native American Tribes, special cultural attention and understanding must be encouraged.

13.1 Food and Water

Because food and clean water are the primary necessities of any community, community sources for these requirements should be examined to determine if subsistence activities, such as fishing and farming, would be adversely impacted. In addition, water sources should be identified (e.g., sole-source aquifers, or rivers) that may be impacted by range activities.

While it is technically feasible to shift the source of these activities to other regions or sources, it is important to note that changes or impacts on these resources may not only have economic considerations, but cultural considerations as well. In some cases religious or historical customs are associated with the use or gathering of these resources.

13.2 Employment

Range activities may have both positive and negative consequences on employment opportunities for local populations. In some cases, the operations may be able to provide jobs; in other cases, operations may create a situation in which businesses choose to relocate. In these instances offering education or training for alternate employment opportunities may mitigate adverse impacts to employment situations.

13.3 Infrastructure

Range operations may require the use of community resources such as utilities or public services. Demands on local power, water, wastewater, and communication supplies must be coordinated with local officials. Upgrades to these systems may be required so that supplies to local communities are not degraded by new demands in support of the mission. In addition, services such as snow removal, street cleaning, and trash pickup must be evaluated to determine if they can support new or changing range activities. Memorandums of Understanding or

Agreement (MOUs/MOAs) between DOD and the local communities will most likely need to be drafted to identify specific arrangements and document areas of agreed-upon responsibilities.

13.4 Environmental Justice

President Clinton issued Executive Order 12898, *Environmental Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, in 1994 promoting the fair treatment of people of all races, income, and culture with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no person or group of people should shoulder a disproportionate share of the negative environmental impacts resulting from the execution of U.S. domestic and foreign policy programs. Therefore, the development of targets or ranges must be shown to not disproportionately affect one population over another. For example, lower income populations may not have the resources to monitor or voice dissent of overflights in their areas, as opposed to populations in higher income areas. Therefore, considerations must be made to not overly burden a particular population with adverse environmental impacts simply because it has no resources or voice to be involved in public decisionmaking.

Chapter

14

Public Relations

14. Public Relations

14.1. Services

14.1.a. Have impacts to local public services been evaluated?

Any changes to public services (e.g., transportation, utilities, access to public areas) need to be communicated to the public early in the process.

Yes ➡ **Continue to 14.2.a**

No ➡ Can a variance or mitigative measures be applied?

When siting a range or target area, consideration on how to minimize these disruptions should be included. In addition, any new services that may need to be developed due to range operations need to be determined and communicated to the affected public.

Yes ➡ **Continue to 14.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

14.2. Disruption of Activities

14.2.a. Have impacts to local activities been evaluated?

If the construction and use of range or target areas impact the daily activities of the surrounding populations, then local communities must be made aware of these issues.

Yes ➡ **Continue to 14.3.a**

No ➡ Can a variance or mitigative measures be applied?

To the extent possible, disruptions should be avoided as much as possible. If disruptions are unavoidable, scheduling with local officials should take place.

Yes ➡ **Continue to 14.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

14.3. Sensitive Resources

14.3.a. Have range operations and location been evaluated for impact on sensitive receptors?

The location of schools, hospitals, nursing homes, and daycare facilities should be considered.

Yes ➡ **Continue to 14.4.a**

No ➡ Can a variance or mitigative measures be applied?

Range and target activities should be located so that sensitive resources are not impacted by operations, including overflight, to the extent practical. Short-term impact from construction or other similar activities should be managed in such a manner as to minimize disturbance (e.g., only do construction during the day/normal working hours, dust suppression, traffic controls).

Yes ➡ **Continue to 14.4.a**

No ➡ Go to Risk Management Considerations at end of matrix.

14.4. Encroachment

14.4.a. Have range operations and location been evaluated for impacts resulting from encroachment of private and other public entities?

Local development must be monitored to ensure that civilian activities do not conflict with current and future operational needs.

Yes ➡ **Continue to 14.5.a**

No ➡ Can a variance or mitigative measures be applied?

The local zoning board or other local governmental agency may need to be contacted about development plans of areas off the range.

Yes ➡ **Continue to 14.5.a**

No ➡ Go to Risk Management Considerations at end of matrix.

14.5. Community Outreach

14.5.a. Have procedures been established to notify the public of significant activities?

At times civilians, NGOs, or local governments will require information on activities occurring on the range.

Yes ➡ **Continue to 14.6.a**

No ➡ Can a variance or mitigative measures be applied?

Protocol and avenues must be established and provided on a continuing basis.

Yes ➡ **Continue to 14.6.a**

No ➡ Go to Risk Management Considerations at end of matrix.

14.6. Regulatory/Local Government Cooperatives

14.6.a. Have cooperatives/Memorandum of Understanding been established?

Cooperatives are key in preventing environmental violations, as well as understanding potential legal actions that may affect future operations on the range.

Yes ➡ **Continue to 15.1.a**

No ➡ Can a variance or mitigative measures be applied?

Protocol and avenues must be established and provided on a continuing basis.

Yes ➡ **Continue to 15.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

Public Relations

14. Background

The public can provide useful information during the planning process and during the decision-making phases of siting a range. By knowing the public's issues and concerns early on in the process, alternatives can be evaluated and mitigating measures can be taken to avoid conflict.

> "Today, almost any action proposed by the military is considered newsworthy and will attract both proponents and opponents. Therefore, it behooves the smart planner to solicit the cooperation and advice of Public Affairs personnel during all aspects of the planning process." *(AFI 13-212 Vol. I, Para 3.3.2)*

14.1 Services

Any changes to public services (e.g., transportation, utilities, access to public areas) need to be communicated to the public early in the process. When siting the range or target areas, consideration on how to minimize these disruptions should be included. In addition, any new services that may need to be developed as a result of range operations need to be considered and communicated to the public early in the process.

14.2 Disruption of Activities

If the use of the proposed ranges could impact the daily activities of the surrounding populations, the communities need to be notified, and the Air Force, to the extent possible, should avoid such impacts as much as possible. For example, road closures, power outages, or excess noise resulting from training operations or UXO clearance activities may present situations that place an unwelcome burden on the local community. If disruptions are necessary, they should be scheduled for hours that provide the least impact, such as nonrush-hour periods, or when school is not in session.

14.3 Sensitive Resources

Sensitive resources are defined as schools, hospitals, nursing homes, daycare facilities, etc. Ranges and target areas should be located, to the extent practical, so that sensitive resources are not impacted by operations, including overflight. Obviously, short-term impacts, such as construction, should be managed to minimize impacts to these resources. This may mean performing operations during nights and weekends, or utilizing engineering controls to limit dust or noise.

14.4 Encroachment

Encroachment is one of the major threats to range and target sustainability. According to DOD, encroachment covers myriad topics such as environmental regulations, airspace restrictions, radio-frequency spectrum, and urban growth.

Understanding trends and remaining active in their development is extremely important. For example:

- Population encroachment is unavoidable and must be managed carefully. Urban growth will impact the operations of every range. It is simply a matter of when it will happen and to what extent. Range operators should stay abreast of local development and zoning changes to ensure civilian activities do not conflict with current or future operational needs.

- Commercial communication systems now have access to frequency bandwith that was once available only to the military. The Federal Communications Commission (FCC) controls access to this bandwith and publishes regulations concerning its use. Guidance is presented in AFI 33-106, *Managing High Frequency Radios, Personal Wireless Communication Systems, and the Military Affiliate Radio System*, and AFMAN 33-120, *Radio Frequency (RF) Spectrum Management*.

- Range activities can be harmonious with environmental needs, but good stewardship and close attention to proper resource management is imperative. Establishment of a good relationship and open lines of communication with state regulators (to include natural resources) goes a long way toward minimizing encroachment concerns. Environmental staff should work closely with state and local regulators to ensure range activities remain in compliance with local laws and expectations.

- Future land use that could alter size requirements should be considered when choosing a location. To eliminate future problems in the selected property, local developers should be contacted to determine proposed land use in the surrounding areas. In addition, local community leaders, planners, and zoning boards should be consulted to create easements and buffer zones around the proposed range.

Relocating missions because of encroachment must be avoided as it is extremely expensive and can adversely impact the overall DOD mission readiness. Limited space and resources are available that can support range missions, and failure to be proactive and participative in these issues may be at the expense of lives during wartime.

14.5 Community Outreach

At times civilians, Non-Governmental Organizations (NGOs), or local governments will require information on activities occurring on the range. Protocol and avenues must be established and provided on a continuing basis.

The Freedom of Information Act (FOIA) is the primary guidance on the release of information. The FOIA is a disclosure law which states that all information in the possession of the government is releasable to the public except for nine

categories. Military Public Affairs (PAs) specialists will be able to assist with questions concerning what information is releasable to the public and how it should be released. PAs should play a continuous and active role during the lifetime of the range. AFI 31-101, *Public Affairs Policies and Procedures* (Chapter 9) discusses the role of the PA in environmental matters and should be consulted when designing and executing public relations plans.

Public safety agencies and law enforcement activities may require access to the range periodically to perform rescue, fire-fighting, law enforcement, and wildlife management actions. Since these agencies may provide mutual support, the range management agency should actively exchange information on munitions identification and avoidance, UXO-contaminated areas, hazmat storage, access procedures, communications, and so forth.

14.6 Regulatory/Local Government Cooperatives

Cooperatives provide a forum for communication between DOD and stakeholders. They allow for an open exchange of ideas and serve to forge an atmosphere of cooperation and understanding. Regulatory and Local Government Cooperatives are key to preventing environmental violations, as well as understanding potential legal actions that may affect future operations on the range.

Chapter

15

Transport Systems

15. Transport Systems

15.1 Land Access

15.1.a. Is the range accessible for mission requirements?

Ensure mission requirements can be adequately accomplished by providing access to target areas. Consider seasonal hazards such as ice, snow, flooding, and mud when evaluating year-round availability.

Yes ➡ **Continue to 15.1.b**

No ➡ Can a variance or mitigative measures be applied?

Implement engineering controls or alternate access mechanisms (e.g., boat, helicopter) as required.

Yes ➡ **Continue to 15.1.b**

No ➡ Go to Risk Management Considerations at end of matrix.

15.1.b. Is the access suitable for O&M activities?

Driving time, roads, and road conditions must be suitable for routine maintenance and UXO clearance and residue removal procedures.

Yes ➡ **Continue to 15.1.c**

No ➡ Can a variance or mitigative measures be applied?

Include any needed road or bridge construction in the mission and economic analysis.

Yes ➡ **Continue to 15.1.c**

No ➡ Go to Risk Management Considerations at end of matrix.

15.1.c. Are bridges required for access suitable in size to support O&M equipment?

Driving time, roads, and road conditions must be suitable for routine maintenance and residue clearance procedures.

Yes ➡ **Continue to 15.2.a**

No ➡ Can a variance or mitigative measures be applied?

Include any needed bridge construction.

Yes ➡ **Continue to 15.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

15.2 Transportation Infrastructure

15.2.a. Are access routes capable of handling DOT-Permitted Hazardous Materials/Waste?

It may be necessary to transport DOT-Permitted Materials/Waste as part of the range operations.

Yes ➡ **Continue to 15.2.b**

No ➡ Can a variance or mitigative measures be applied?

Required in accordance with 15.3. CFR 100-185. Assess alternative routes to access the target area.

Yes ➡ **Continue to 15.2.b**

No ➡ Site is unsatisfactory

15.2.b. Will public transportation corridors (land, air, and waterways) remain unaffected?

In some cases there may be a need to reroute public transportation corridors.

Yes ➡ **Continue to 15.2.c**

No ➡ Can a variance or mitigative measures be applied?

Rerouting of significant transportation corridors should be avoided.

Yes ➡ **Continue to 15.2.c**

No ➡ Go to Risk Management Considerations at end of matrix.

15.2.c. Will rail corridors remain unaffected?

In some cases there may be a need to reroute rail corridors.

Yes ➡ **Continue to 16.1.a**

No ➡ Can a variance or mitigative measures be applied?

Rerouting of significant rail corridors should be avoided. In some cases it may be possible to cease operations to allow rail movement.

Yes ➡ **Continue to 16.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

Transport Systems

15. Background

Because of their remoteness, training ranges face transport challenges. Not only is access to and from the range and target areas an issue, but operations may also affect public access routes. Therefore, transport systems include all aspects of mobility on or off the range. This includes roads, railways, waterways, and air corridors.

15.1 Land Access

Ensure the range is reasonably accessible to the operating agency. Driving time, roads, and road conditions must be suitable to support routine maintenance, UXO clearance, and residue removal operations. Seasonal hazards, such as ice, snow, flooding, and mud should be considered when evaluating year-round availability. Dirt roads must be graded. Bridges providing primary access must accommodate all range maintenance equipment and support projected loads by the residue removal operations. Any necessary road or bridge construction should be included in the analysis for costing purposes.

There are many other aspects impacting land access routes, including the following:

a. When locating a target, designers need to anticipate the types of activities that will require access routes and what those routes may require. Activities such as range operations, security, or target replacement require vehicles and personnel. Additionally, access routes may need to be assessed for their viability throughout the year. Rain, snow, wind, etc., may adversely impact the usability of the route and this must be anticipated in conjunction with mission requirements.

   Maintenance or special projects on public roads may ultimately affect range operations (e.g., partial closure of lanes may affect the maintenance crew's ability to haul large, heavy equipment to the range). Explosive transport may also be inhibited by these changes. Plans and schedules may need to be altered to accommodate these projects.

b. Operations and maintenance activities such as debris removal and UXO clearance may present special access needs.

   Note: If a target is required to be located in a remote location or over water, access decisions must include transport carrier types, anticipated loads, and personnel requirements. This may present additional safety risks as well as maintenance costs for upkeep of watercraft and storage.

   Access routes also need to be designed such that they provide optimum access for target and mission requirements, while not encouraging use by unauthorized personnel. Routes must not be tempting to public curiosity,

off-road sports (such as mountain biking, and ATVs), hiking, and other such activities.

c. In some cases vehicle loads may be considerable, such as in range residue removal or heavy equipment transport. In these instances engineering controls, bridges, or alternative routes can be used to enhance accessibility. These, however, will most likely increase overall maintenance or construction costs. If, for example, base course is used to enhance a roadway matrix, it will require maintenance grading and usually annual enhancement.

   Because targets are typically located in remote areas, access to and from target areas can often require a significant amount of time. Some existing targets require 3 or 4 hours of transport time just to reach the site, which obviously affects mission requirements through increased range downtime. Therefore, economic considerations bearing on road infrastructure must include transport time.

15.2 Transportation Infrastructure

Existing public transportation infrastructure includes roads, waterways, air corridors, and railroads. These access routes must be evaluated to determine their ability to accommodate mission requirements and their subsequent operational and maintenance support needs. In some cases there may be points of concern significantly outside the range property. Range or target support activities may be required to travel through towns or cities miles away from the actual target area simply because of limited route options. In other cases the access routes may not be able to support mission needs (e.g., roads are too narrow, bridges are too low or not capable of handling heavy loads). In these cases the public infrastructure may require enhancement at DOD's expense. Other considerations include the following:

a. It may be necessary to transport Department of Transportation (DOT)-permitted materials or EPA-regulated wastes to support range operations, such as explosives and fuels. Public access routes will again need to be evaluated to determine existing capabilities and whether alternate routes or structural enhancements are required. In some cases transport of these items may be limited to certain times of the day or by season. In these cases it may be necessary to construct storage facilities and obtain the appropriate environmental or safety permits. Guidance is presented in the following:

   - 40 CFR 260, Hazardous Waste Management System
   - AFI 32-7041, Solid and Hazardous Waste Compliance
   - AFMAN 91-201, Air Force Explosive Safety Standards

b. Before establishing a need for new airspace, users must ensure they comply with AFI 13-201, *Air Force Airspace Management*, AFI 32-7061, *The Environmental Impact Analysis Process,* and applicable FAA Directives, which require a review of existing airspace to determine if the proposed action can be "accommodated within or by modifying existing areas." FAA

Directives also require that the military accommodate the maximum number of operations in existing airspace and limit the proliferation of new airspace. If, after reviewing existing airspace, the need still cannot be accommodated, then proponents will initiate the EIAP and work with the Unit/MAJCOM Airspace Manager and AFREP to secure the necessary charted airspace.

The dimensions and times of use of Special Use Airspace (SUA) shall be the minimum required for containing the proposed activities, including safety zones required by military authority. According to FAA Order 7400.2E, airspace use shall be optimized to accommodate the following considerations:

- To ensure the optimum use of airspace, using agencies shall, where mission requirements permit, make their assigned SUA available for the activities of other military units on a shared-use basis.

- SUA should be located to impose minimum impact on nonparticipating aircraft and Air Traffic Control operations. This should be balanced with consideration of the proponent's requirements. To the extent practical, SUA should be located to avoid airways/jet routes, major terminal areas, and known high-volume visual flight rules (VFR) routes.

- Consider subdividing large SUA areas, where feasible, in order to facilitate the real-time release of the airspace when activation of the entire area is not required by the user.

c. Rail corridors often come through or adjacent to many ranges. In some cases, this may offer a method for range residue transport if local loading spurs or stations can be used. However, because railroads are limited in region and nature, it may be difficult to relocate rail services that conflict with mission requirements. Therefore, care must be taken to identify rail operations that may hinder or be hindered by the mission. For example:

   - Railcars hauling hazardous materials may need special safety considerations such as limitations on aircraft overflights. In this case it may be possible to change sortie times or routes.

   - Explosive operations should be curtailed when railcars are expected or located in the vicinity.

Chapter

16

Operations and Maintenance

16. Operations and Maintenance

16.1 Security

16.1.a. Have security issues been adequately addressed?

Appropriate levels of security should be considered in relation to the operations and location. Potential threats must be evaluated prior to establishing target areas and be continually monitored.

Yes ➡ **Continue to 16.1.b**

No ➡ Can a variance or mitigative measures be applied?

A system needs to be designed and implemented that will keep the target areas and surrounding areas free of unwanted personnel and activities.

Yes ➡ **Continue to 16.1.b**

No ➡ Go to Risk Management Considerations at end of matrix.

16.1.b. Have physical barriers been designed as part of range or target areas?

Appropriate levels of physical security should be considered in relation to the operations and location. In some circumstances, fences may need to be considered to limit access by the public to the target area (Ref. DODD 4715.11/.12).

Yes ➡ **Continue to 16.1.c**

No ➡ Can a variance or mitigative measures be applied?

Physical barriers must be designed to enhance mission security, but not cause adverse complications with natural flora and fauna (e.g., blocking migration routes).

Yes ➡ **Continue to 16.1.c**

No ➡ Go to Risk Management Considerations at end of matrix.

16.1.c. Have security personnel and monitoring been established for the range or target area?

Human reconnaissance must be integrated into the security system. Patrolling either on foot or by vehicle will require roads or paths. Ensure these do not create adverse conditions to natural resources.

Yes ➡ **Continue to 16.2.a**

No ➡ Can a variance or mitigative measures be applied?

In some cases, electronic surveillance systems may offset the need for remote area access by security personnel.

Yes ➡ **Continue to 16.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

16.2 Emergency Response

16.2.a. Can local Emergency Services support new mission requirements?

Evaluate Emergency Service capabilities (e.g., medical, fire suppression equipment) to support new mission requirements.

Yes ➡ **Continue to 16.3.a**

No ➡ Can a variance or mitigative measures be applied?

In some cases EMS personnel or equipment may have to be supplied or enhanced. Establish agreement for emergency EOD support with closest EOD unit.

Yes ➡ **Continue to 16.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

16.3 Fire

16.3.a. Are precautions taken to minimize unwanted fires?

Naturally initiated burns can cause UXO to become unstable, release toxic constituents into the environment, restrict access, and impact mission effectiveness. In addition, opens issues of invasive species.

Yes ➡ Continue to 16.3.b

No ➡ Can a variance or mitigative measures be applied?

Develop and implement a Fire Control Plan (Ref: AFI 32-2001).

Yes ➡ Continue to 16.3.b

No ➡ Go to Risk Management Considerations at end of matrix.

16.3.b. Are controlled burns established as part of target area/range maintenance?

Controlled burns can minimize the adverse impacts of naturally initiated burns.

Yes ➡ Continue to 16.3.c

No ➡ Can a variance or mitigative measures be applied?

Develop and implement a Fire Control Plan (Ref: AFI 32-2001).

Yes ➡ Continue to 16.3.c

No ➡ Go to Risk Management Considerations at end of matrix.

16.3.c. Are fire breaks established?

Fire breaks can minimize the adverse impacts of naturally initiated burns; however, they can also have adverse impacts on wildlife and natural resources, and can create erosion issues.

Yes ➡ Continue to 16.4.a

No ➡ Can a variance or mitigative measures be applied?

Develop and implement a Fire Control Plan (REF: AFI 32-2001). Use GIS to route breaks in a manner that minimizes unwanted disturbances to natural resources, and apply engineering controls to minimize erosion and sediment transport issues (e.g., berms, backfill, ground cover) (Ref: Sikes Act).

Yes ➡ Continue to 16.4.a

No ➡ Go to Risk Management Considerations at end of matrix.

16.4 Power Systems

16.4.a. Have the power requirements to support the mission been evaluated?

Construction and maintenance of power systems must be evaluated for meeting mission and O&M requirements. This includes the maintenance aspects of generation and distribution systems.

Yes ➡ Continue to 16.5.a

No ➡ Can a variance or mitigative measures be applied?

New or enhanced generation and distribution systems may be required. Consider implications to natural and cultural resources.

Yes ➡ Continue to 16.5.a

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

16.5 Water Systems

16.5.a. Have water requirements to support the mission been evaluated?

Construction and maintenance of water supply and distribution must be evaluated for meeting mission and O&M requirements (e.g., dust suppression during range maintenance). This includes the maintenance aspects of the systems.

Yes ➡ Continue to 16.6.a

No ➡ Can a variance or mitigative measures be applied?

New or enhanced supply and distribution systems may be required. Consider implications to natural and cultural resources. In some cases discharges may require NPDES permits.

Yes ➡ Continue to 16.6.a

No ➡ Go to Risk Management Considerations at end of matrix.

16.6 Wastewater Systems

16.6.a. Have wastewater requirements to support the mission been evaluated?

Construction and maintenance of wastewater treatment and discharge must be evaluated for meeting mission and O&M requirements. This includes the maintenance aspects of the systems.

Yes ➡ Continue to 16.7.a

No ➡ Can a variance or mitigative measures be applied?

Ensure the appropriate environmental documentation is completed prior to the construction of any treatment or discharge facilities.

Yes ➡ Continue to 16.7.a

No ➡ Go to Risk Management Considerations at end of matrix.

16.7 Communication

16.7.a. Have requirements for communication systems been established?

Construction and maintenance of communication equipment and facilities must be evaluated for meeting mission and O&M requirements (e.g., scoring systems and aircraft control, and ground party communications). This includes the maintenance aspects of the systems.

Yes ➡ Continue to 16.7.b

No ➡ Can a variance or mitigative measures be applied?

Communication facilities can often invite unwanted wildlife. Evaluate impact on wildlife and apply wildlife management controls.

Yes ➡ Continue to 16.7.b

No ➡ Go to Risk Management Considerations at end of matrix.

16.7.b. Have construction impacts of communication systems been evaluated?

Construction and maintenance of communication equipment and facilities may impact natural and cultural resources.

Yes ➡ Continue to 16.8.a

No ➡ Can a variance or mitigative measures be applied?

Ensure the appropriate environmental analysis is conducted prior to the construction of any facilities.

Yes ➡ Continue to 16.8.a

No ➡ Go to Risk Management Considerations at end of matrix.

16.8 Maintenance–Generated Wastes

16.8.a. Have waste streams been identified?

The generation and disposition of solid waste, oil/fuels from target or range vehicles, hazardous waste, low-level radioactive waste, construction debris, or natural wastes (e.g., shrubs, plants, trees) must be adequately evaluated.

Yes ➡ **Continue to 16.9.a**

No ➡ Can a variance or mitigative measures be applied?

Develop and implement a Solid Waste Management Plan, Hazardous Waste Management Plan, and/or Recycling Plan. For large ranges or ranges in remote locations, a solid waste landfill may need to be considered.

Yes ➡ **Continue to 16.9.a**

No ➡ Go to Risk Management Considerations at end of matrix.

16.9 UXO Management

16.9.a. Have written agreements (policy agreements/MOU) with the closest military EOD unit been established for emergency support?

Ref. AFJI 32-3002. UXO can occur off-range or in the contaminant area.

Yes ➡ **Continue to 16.9.b**

No ➡ Can a variance or mitigative measures be applied?

Establish an MOU. If response will be in excess of 4 hours, ensure that coordination takes place with local law enforcement/ Major Command.

Yes ➡ **Continue to 16.9.b**

No ➡ Go to Risk Management Considerations at end of matrix.

16.9.b. Has programmed UXO clearance support been established with military EOD or contractual civilian UXO company?

Ref. AFI 32-3001 and 13-212. Periodic UXO clearance is required for safety purposes.

Yes ➡ **Continue to 16.9.c**

No ➡ Can a variance or mitigative measures be applied?

Ensure long-term availability of military EOD or contracted UXO clearance/removal support.

Yes ➡ **Continue to 16.9.c**

No ➡ Go to Risk Management Considerations at end of matrix.

16.9.c. Have periodic UXO clearance activities/criteria been coordinated with range owners (for ranges owned by another service)?

MOUs may be required from other agencies (e.g., USMC, Army, Navy) to support UXO clearance requirements.

Yes ➡ **Continue to 16.9.d**

No ➡ Can a variance or mitigative measures be applied?

Contracted UXO support may need to be considered.

Yes ➡ **Continue to 16.9.d**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

16.9.d. Have NEW limits for EOD operations been established?

EOD operations may require net explosive weight (NEW) limits greater than the munitions used and this will impact the amount of buffer area required to support this type of operation.

Yes ➡ **Matrix Complete**

No ➡ Can a variance or mitigative measures be applied?

Is some cases NEW limits may be decreased by limiting detonation size.

Yes ➡ **Matrix Complete**

No ➡ Go to Risk Management Considerations at end of matrix.

Operations and Maintenance

16. Background

Operation and maintenance activities are operations that are essential to target and range management. They include actual training missions, as well as the resources needed to support these operations, such as the physical target and its supporting facilities. Good maintenance of these assets is key to preserving these resources for long-term use. Not only does this permit the sustainability of target areas, it preserves the environment and enhances overall safety. DODD 4715.11/.12, *Environmental and Explosive Safety Management on Department of Defense Active and Inactive Ranges within the United States/Outside the United States*, provides DOD-level guidance for range maintenance. Also, AFI 13-212 Vols. I and II define Air Force range management requirements.

In addition, it is important to remember that all ranges have a service life and to consider target closure or potential end uses of the property when that service life ends. Design, use, and maintenance must be evaluated cradle to grave to recognize their impact on the property's final disposition. Evaluation of potential end-use scenarios will change throughout the life of the property as the community and its needs develop around the range, and the Air Force's needs for land to support training requirements change. Therefore, end-use considerations must continually be updated and modified accordingly.

16.1 Security

The primary security concern is to prevent public access for safety reasons. Security of the range and target areas as well as the surrounding buffer zones are a critical aspect of range management.

a. A system that limits access to the range and surrounding areas from outside parties must be designed and implemented. Appropriate levels of security should be considered in relation to the operations and location. A threat analysis is imperative for proper design of security systems. Threats can be identified not only as intentional access by unauthorized personnel, such as undocumented aliens and drug smugglers, but also unintentional, such as hunters or hikers.

b. Have barriers been installed at the farthest safety zone to deter access to the area by the public without unnecessary impact to the environment? Establishing explosive safety zones, buffer zones, and pilot error zones will help enhance public safety. In some cases, physical and electronic security barriers and security force personnel may also be necessary.

c. Whenever feasible electronic surveillance should be used for monitoring purposes to minimize the number of personnel in the target area while the range is in use. If electronic surveillance is not an option, then the security personnel should be employed in regions no closer than the outermost safety zone, as referenced above.

16.2 Emergency Response

Because of target and range isolation, it is critical to have emergency services available. In cases of personnel safety it is highly recommended that a paramedic be available in the safe area during target maintenance activities. Because of the long transport time to the hospital, local paramedics must be trained and have the authority to administer life-saving drugs and fluids. Emergency medical technicians with lesser qualifications cannot always provide the necessary care. In addition, it is wise for all range personnel to be trained in first aid and CPR.

Emergency transportation and off-site emergency care should be identified in operational plans. Life Flight services may also be required to access remote targets. In some cases an MOU or MOA may need to be established with local emergency service providers. In all cases, methods for direct communications should be established with emergency response personnel and hospitals.

16.3 Fire

To help prevent fires and the spread of fires, appropriate fire controls should be used. AFI 32-2001, *The Fire Protection Operations and Fire Prevention Program*, provides guidance on the development and implementation of fire control plans. In the event of the range or target area catching fire, all emergency response personnel along with range maintenance personnel should stand by downrange in a safe place, but no closer than the outermost safety zone. The concern here is to not only prevent the fire from spreading off the range, but also to prevent personnel from entering the range and subjecting themselves to the danger of UXO detonations.

a. Naturally initiated fires as well as those controlled burns set intentionally have the potential to negatively impact target areas. Fires can cause UXO to become unstable and explode randomly, thereby limiting access to the site to fight the fire. Additionally, ignition of unexpended flares on the ground can intensify the fire. There are also concerns regarding the release of toxic constituents into the environment from natural sources as well as UXO and target features. Finally, mission requirements can be adversely impacted by target downtime resulting from a fire.

b. Despite the negative consequences of having a fire on a target, it may be necessary to implement controlled burns in order to control brush or other unwanted vegetation. Careful planning and coordination is necessary with local communities, environmental regulators, other federal agencies, and emergency response personnel.

c. Firebreaks are an important aspect of range and target design. They can minimize the impacts of naturally initiated fires and aid in controlling all fires. However, they can also have adverse impacts on maintenance requirements and environmental resources since they must be cleaned out periodically to remain effective. Firebreaks require disking, grading, or mowing for a considerable distance. Additionally, because of the areas consumed by firebreaks, they can adversely impact wildlife or other natural resources. In desert areas, they can be prone to erosion, which

can lead to sedimentation problems and the introduction of invasive plants.

In some cases, engineering controls can be used to minimize these problems. In some cases range personnel may choose to supplement their training by taking specialized fire-fighting courses.

16.4 Power Systems

Power systems may be needed for scoring facilities or operations as well as range support facilities. Therefore, power requirements need to be established early and periodically reevaluated. Some considerations are listed below:

- Existing distribution or generation sources may require upgrading and backup generators may need to be installed.
- In some cases, it may be possible to use alternative energy sources (e.g., wind or solar). However, such sources should be implemented in such a manner that they are not mistaken for a target feature.
- Distribution and generation facilities should be kept away from actual target areas because they could potentially be impacted by vibration and noise from low-level training or become damaged by munition releases.
- Power systems require maintenance and upkeep, impacting maintenance costs and requiring specially trained personnel.

16.5 Water Systems

Range operations typically require at least a nonpotable water source. In some cases it may be necessary to provide potable water for facilities where range staff spend a considerable amount of time on the job. Water is needed to support manned facilities and fire suppression efforts, and in some cases to control dust. This may require the construction or upgrade of existing water supplies and their distribution network. In some cases it may be possible to develop wells to provide this support.

If water is discharged, it may be necessary to obtain NPDES permits.

16.6 Wastewater Systems

If the range is manned, there will most likely be a need for a wastewater treatment system to support the facility. In many cases these systems can be localized, such as leach fields or stabilization ponds.

16.7 Communication

If the range is manned, there will be a need for reliable communication, both primary and backup. It is recommended that hard-wire phone lines be used as a primary means of ground communication and radio or cellular phones as a backup. In support of this, distribution lines may be required that can link mission tracking requirements (e.g., scoring, or target users), range personnel,

and facilities. Reliable air-to-ground communications are also critical for safe operations, such as UHF-, VHF-, and FM-capable systems.

Target maintenance personnel will require communications (e.g., cell phones or radios) that can be accessed in all parts of the range for emergency and logistical coordination. This may require construction of communication equipment and facilities such as repeater towers. Coordination is required with the appropriate serving frequency manager to obtain the proper radio licenses. Management of these frequencies requires periodic review; plans must be in place to ensure continued viability.

16.8 Maintenance-Generated Wastes

Classifying used materials as a recyclable or as a solid waste should be fully evaluated prior to implementing any removal or storage actions. The waste generated by the range will include, but is not limited to, target preparation waste (e.g., fuel, oils, hydraulic fluid, batteries, low-level rad waste-gauges, etc.), ordnance debris, target residue, and other facility and maintenance wastes.

The BDU-33 is constructed of a high-grade metal. Because of this and the spent targets generated (e.g., tanks, JMGTs, etc.), potential recycling avenues should be identified and controls developed to turn scrap materials over for recycling. Controls include fenced storage facilities, proper demilitarization of UXO and target scrap, and documentation of actions taken. All range-generated scrap or waste must be certified free of hazardous constituents prior to turn-in.

If the range is manned there will be office as well as other nontarget-related waste (e.g., construction debris). If used materials will be ultimately disposed of as a waste, then they become part of a waste stream. Establishing the necessary controls for these waste streams is important. These wastes must not be mixed with target residue to eliminate the possibility of cross-contaminating explosive and hazardous wastes with other solid wastes. It may be necessary to permit removal of low-level radiological wastes from the target until authorization is received from the servicing bioenvironmental engineer to ship it to the appropriate disposal facility.

16.9 UXO Management

One critical aspect of range maintenance involves the management of UXO. Care must be taken to ensure range scrap does not contain UXO or related hazardous components. Every year civilian personnel and facilities are involved in injuries or accidents resulting from the unintended release of UXO.

a. Unintended releases of UXO include the inadvertent delivery of ordnance off target and accidental releases from weapon platforms. Another potential source is unauthorized removal of UXO by trespassers or visitors on the range. Coordination and MOUs may be required with local officials to provide emergency EOD response for these circumstances. AFJI 32-3002, *Interservice Responsibilities for Explosive Ordnance Disposal*, provides guidance on DOD's responsibility for emergency responses of this nature.

b. Target areas will require periodic UXO clearance. AFI 13-212 dictates appropriate times and clearance distances for specific target areas. Clearances may be performed by military EOD personnel or commercial UXO-qualified technicians. Clearance of BDU-33 can be very strenuous. Because of the physical labor involved with clearing targets contaminated with this type of ordnance, care must be taken to schedule clearance times so as to not physically stress the workers excessively. Common injuries associated with this type of clearance include chronic lower back, rotator cup, and wrist injuries. Long-term health monitoring and appropriate physical training should be implemented.

c. In some cases other services may be responsible for target maintenance because of their real property ownership. In these cases MOUs and MOAs must be drafted to ensure target areas receive the proper maintenance required to meet mission needs, safety, and environmental stewardship.

d. Net Explosive Weight (NEW) limits will need to be established for each target area or range. These limits dictate the maximum explosive quantities that can be used during UXO disposal operations. The NEW will be influenced by the area size and designated buffer zones.

APPENDIX A – WEAPON SAFETY FOOTPRINTS FOR BDU-33

Appendix A
Weapon Safety Footprints for the BDU-33

ID	Service	Aircraft	Event	Weapon	Range	Target	Dive Angle	Altitude	Speed	A (Long)	B (Cross)	C (Short)
5	US Air Force	A-10	DB	BDU-33	CONTROLLED	SOFT	-30 to -45	2000 to 2500	350	3125	2500	2500
6	US Air Force	A-10	DB	BDU-33	LT TAC	ALL	-20 to -40	1500 to 10000	300 to 400	2621	2035	2035
7	US Air Force	A-10	DB	BDU-33	HT TAC	ALL	-20 to -40	1500 to 10000	300 to 400	5531	3365	3365
10	US Air Force	A-10	HADB	BDU-33	LT TAC	ALL	-30 to -60	4500 to 10000	350 to 450	1373	1514	1514
11	US Air Force	A-10	HADB	BDU-33	HT TAC	ALL	-30 to -60	4500 to 10000	350 to 450	1648	2280	2280
18	US Air Force	A-10	HARB	BDU-33	LT TAC	ALL	+5 to -60	10000 to 20000	200 to 400	2135	2408	2408
19	US Air Force	A-10	HARB	BDU-33	HT TAC	ALL	+5 to -60	10000 to 20000	200 to 400	3397	4437	4437
24	US Air Force	A-10	LAB	BDU-33	CONTROLLED	SOFT	0 to -20	600	325	3150	2500	2500
25	US Air Force	A-10	LAB	BDU-33	CONTROLLED	HARD	0 to -20	600	325	3696	2500	2500
26	US Air Force	A-10	LAHD	BDU-33	LT TAC	ALL	0 to -30	100 to 3000	250 to 350	1246	808	808
27	US Air Force	A-10	LAHD	BDU-33	HT TAC	ALL	0 to -30	100 to 3000	250 to 350	1867	1222	1222
30	US Air Force	A-10	LALD	BDU-33	CONTROLLED	SOFT	-20 to -30	1500 to 2000	325	2900	2800	2800
31	US Air Force	A-10	LALD	BDU-33	LT TAC	ALL	-10 to -30	1000 to 10000	250 to 400	1807	1057	1057
32	US Air Force	A-10	LALD	BDU-33	HT TAC	ALL	-10 to -30	1000 to 10000	250 to 400	1266	1145	1145
37	US Air Force	A-10	LAT	BDU-33	LT TAC	ALL	+5 to -45	1000 to 10000	250 to 400	2964	1973	1973
38	US Air Force	A-10	LAT	BDU-33	HT TAC	ALL	+5 to -45	1000 to 10000	250 to 400	5578	3349	3349
47	USAF (ANG Request)	A-10	MAT	BDU-33	LT TAC	ALL	+5 to -45	5000 to 15000	250 to 350	3016	1967	1967
48	US Air Force	A-10	MAT	BDU-33	LT TAC	ALL	+5 to -45	10000 to 15000	250 to 450	3407	2040	2040
49	US Air Force	A-10	MAT	BDU-33	HT TAC	ALL	+5 to -45	10000 to 15000	250 to 450	5710	3409	3409
57	US Air Force	A-10	VLD	BDU-33	LT TAC	ALL	-5 to +5	100 to 15000	200 to 350	1373	952	952
58	US Air Force	A-10	VLD	BDU-33	HT TAC	ALL	-5 to +5	100 to 15000	200 to 350	1895	1863	1863
71	US Air Force	ALL	LOFT	BDU-33	LT TAC	SOFT	0 to +60	100 to 9000	300 to 600	7750	2000	2000
72	US Air Force	ALL	LOFT	BDU-33	LT TAC	HARD	0 to +60	100 to 9000	300 to 600	10065	2000	2000
73	US Air Force	ALL	LOFT	BDU-33	HT TAC	SOFT	0 to +60	100 to 9000	300 to 600	9550	3500	3500
74	US Air Force	ALL	LOFT	BDU-33	HT TAC	HARD	0 to +60	100 to 9000	300 to 600	11508	3500	3500
79	US Air Force	AT-38	DB	BDU-33	CONTROLLED	ALL	-25 to -40	1500 to 10000	350 to 500	4815	3936	3936
79	US Air Force	AT-38	30 Deg DB	BDU-33	CONTROLLED	ALL	30 to 30	3500 to 3500	450 to 450	4363	3269	3269
80	US Air Force	AT-38	HADB	BDU-33	CONTROLLED	ALL	-30 to -50	4500 to 10000	350 to 500	5021	3857	3857
81	US Air Force	AT-38	LAHD	BDU-33	CONTROLLED	ALL	0 to -30	100 to 2000	350 to 500	5931	2967	2967
82	US Air Force	AT-38	LALD	BDU-33	CONTROLLED	ALL	0 to -30	100 to 10000	350 to 500	5841	3229	3229
82	US Air Force	AT-38	20 Deg LALD	BDU-33	CONTROLLED	ALL	-20 to -20	2000 to 2000	450 to 450	2950	2962	2962
82	US Air Force	AT-38	10 Deg LALD	BDU-33	CONTROLLED	ALL	-10 to -10	450 to 750	450 to 450	3834	2870	2870
83	US Air Force	AT-38	VLB	BDU-33	CONTROLLED	ALL	-5 to +5	100 to 1000	350 to 500	6603	4581	4581
83	US Air Force	AT-38	Level	BDU-33	CONTROLLED	ALL	0 to 0	300 to 500	450 to 450	5135	4580	4580
85	US Air Force	B-1B	LEVEL	BDU-33	ALL	ALL	0 to 0	300 to 2000	450 to 600	5398	2661	2661
89	US Air Force	B-1B	LEVEL Radar	BDU-33	ALL	ALL	0 to 0	300 to 40000	350 to 650	5338	6172	6172
90	US Air Force	B-1B	LEVEL Radar	BDU-33C	ALL	ALL	0 to 0	300 to 40000	300 to 650	1898	5524	5524
135	US Air Force	F-117	LEVEL	BDU-33	LT TAC	ALL	-5 to +5	2000 to 25000	350 to 550	3727	3519	3519
136	US Air Force	F-117	LEVEL	BDU-33	HT TAC	ALL	-5 to +5	2000 to 25000	350 to 550	5182	5202	5202

Source : AFI 13-212 Vol III

Appendix A
Weapon Safety Footprints for the BDU-33
(Continued)

ID	Service	Aircraft	Event	Weapon	Range	Target	Dive Angle	Altitude	Speed	A (Long)	B (Cross)	C (Short)
141	US Air Force	F-15	DB	BDU-33	CONTROLLED	SOFT	-30 to -45	3500 to 5000	450 to 500	2100	2100	2100
143	US Air Force	F-15	LALD	BDU-33	CONTROLLED	SOFT	-15 to -20	1700 to 2500	450 to 500	2300	1800	1800
147	US Air Force	F-16	DB	BDU-33	CONTROLLED	SOFT	-30 to -45	3500 to 5000	450	3300	1600	1600
148	US Air Force	F-16	DB	BDU-33	CONTROLLED	SOFT	0 to -15	100 to 700	400 to 600	7476	1378	1378
149	US Air Force	F-16	DB	BDU-33	CONTROLLED	SOFT	0 to -35	700 to 2500	400 to 600	1442	1168	1168
150	US Air Force	F-16	DB	BDU-33	LT TAC	ALL	-25 to -40	1500 to 10000	350 to 550	5936	3168	3168
151	US Air Force	F-16	DB	BDU-33	HT TAC	ALL	-25 to -40	1500 to 10000	350 to 550	9516	4298	4298
156	US Air Force	F-16	LAB	BDU-33	CONTROLLED	SOFT	-10	600 to 700	450	1900	1550	1550
157	US Air Force	F-16	LAB	BDU-33	CONTROLLED	HARD	-10	600 to 700	450	2087	1550	1550
158	US Air Force	F-16	LALD	BDU-33	CONTROLLED	SOFT	-15 to -20	1700 to 2500	450	2350	1500	1500
163	US Air Force	F-16	LOFT	BDU-33	CONTROLLED	SOFT	0 to +60	200 to 5000	300 to 540	7727	3453	3453
164	US Air Force	F-16	LRDT	BDU-33	CONTROLLED	SOFT	-60 to +30	100 to 15000	300 to 540	6210	1086	1086
168	US Air Force	F-16	VLD/RLD	BDU-33	CONTROLLED	SOFT	0 to 0	100 to 600	300 to 540	6811	2598	2598
169	US Air Force	F-16	VLD/RLD	BDU-33	CONTROLLED	SOFT	0 to 0	600 to 5000	300 to 540	2165	904	904
170	US Air Force	F-16/F-15	GP Loft	BDU-33	LT TAC	ALL	0 to +45	300 to 5000	350 to 550	9973	4419	4419
171	US Air Force	F-16/F-15	GP Loft	BDU-33	HT TAC	ALL	0 to +45	300 to 5000	350 to 550	16085	5956	5956
175	US Air Force	F-16/F-15	HADB	BDU-33	LT TAC	ALL	-30 to -50	4500 to 10000	350 to 550	3055	2211	2211
176	US Air Force	F-16/F-15	HADB	BDU-33	HT TAC	ALL	-30 to -50	4500 to 10000	350 to 550	3983	10148	10148
179	US Air Force	F-16/F-15	HARB	BDU-33	LT TAC	ALL	-30 to -50	10000 to 20000	350 to 550	3299	4423	4423
180	US Air Force	F-16/F-15	HARB	BDU-33	HT TAC	ALL	-30 to -50	10000 to 20000	350 to 550	2524	5709	5709
184	US Air Force	F-16/F-15	LAHD	BDU-33	LT TAC	ALL	0 to -30	100 to 2000	350 to 550	4885	2340	2340
185	US Air Force	F-16/F-15	LAHD	BDU-33	HT TAC	ALL	0 to -30	100 to 2000	350 to 550	11893	11141	11141
188	US Air Force	F-16/F-15	LALD	BDU-33	LT TAC	ALL	0 to -30	1000 to 10000	350 to 550	4880	4494	4494
189	US Air Force	F-16/F-15	LALD	BDU-33	HT TAC	ALL	0 to -30	1000 to 10000	350 to 550	3395	4378	4378
193	US Air Force	F-16/F-15	LAT	BDU-33	LT TAC	ALL	-30 to +30	300 to 10000	350 to 550	3852	3478	3478
194	US Air Force	F-16/F-15	LAT	BDU-33	HT TAC	ALL	-30 to +30	300 to 10000	350 to 550	5873	3513	3513
210	US Air Force	F-16/F-15	SLD	BDU-33	LT TAC	ALL	-5 to +5	300 to 25000	350 to 550	5595	4885	4885
211	USAF (ANG Request)	F-16/F-15	SLD	BDU-33	LT TAC	ALL	-5 to + 5	100 to 5000	350 to 550	7175	1488	1488
212	US Air Force	F-16/F-15	SLD	BDU-33	HT TAC	ALL	-5 to +5	300 to 25000	350 to 550	9130	8184	8184
219	US Air Force	F-16/F-15	VLD	BDU-33	LT TAC	ALL	-5 to +5	300 to 25000	350 to 550	2965	2154	2154
220	USAF (ANG Request)	F-16/F-15	VLD	BDU-33	LT TAC	ALL	-5 to +5	100 to 5000	350 to 550	3898	2260	2260
221	US Air Force	F-16/F-15	VLD	BDU-33	HT TAC	ALL	-5 to +5	300 to 25000	350 to 550	4676	3843	3843
227	US Air Force	F-4	DB	BDU-33	CONTROLLED	SOFT	-30	3000 to 3500	450	2500	3200	3200
228	US Air Force	F-4	LAB	BDU-33	CONTROLLED	SOFT	-10	600 to 700	450	4500	3200	3200
229	US Air Force	F-4	LAB	BDU-33	CONTROLLED	HARD	-10	600 to 700	450	4582	3200	3200
230	US Air Force	F-4	LALD	BDU-33	CONTROLLED	SOFT	-15 To -20	1700 to 2500	450	2600	3200	3200
231	US Air Force	F-4	VLD/RLD	BDU-38	CONTROLLED	SOFT	LEVEL	300 to 1000	500 to 540	19472	1601	1601

Source : AFI 13-212 Vol III

APPENDIX B – PROACT COMMENTS

HQ AFCEE
Air Force Center
for Environmental
Excellence
Environmental Quality
Directorate
Brooks AFB, Texas

The AFCEE Team recognized as a customer-oriented leader and the prefered provider of environmental planning, design and construction services.

28 January 2000

RE: PROACT Technical Inquiry 21012 - Hazwaste Classification for Munitions

Dear PR0-ACT User:

This letter is in response to your 13 January 2000 request for information regarding the following practice munitions: Bomb Dummy Units (BDUs) 33, 45, and 50 and 2.75 inch rockets. Specifically, you stated that your installation has many of these practice bombs which contain residues left from the use of "spotting charges." You need answers to the following questions:

1. Are there any analytical results available that would indicate if residues from these munitions are hazardous waste? and

2. Is there any disposal guidance relative to these munitions?

You stated you maintain a permit that allows you to bury the munitions on-site, provided they are non-hazardous waste, and that you need to know if any testing has been accomplished that indicates whether the practice munitions are either hazardous or non-hazardous.

Question #1

PRO-ACT contacted Ms. Rosanna Bandemehr, Operations Division, Headquarters Defense Reutilization and Marketing Service (HQ DRMS/SOM), DSN 932-7273, who stated that she is not aware of any hazardous waste analysis having been accomplished on specific munitions.

We next spoke with Chief Master Sergeant Henry Domme, Explosive Ordnance,

56 CES/XO, Luke AFB, DSN 896-6427, who stated that his base does not analytically characterize practice bombs prior to disposal. He stated that there is not enough residue left over to test. He advised the best option is to

have the bombs "flashed" to rid the bomb of any residue, and then demilitarize the munition. For your review, we are enclosing a report written by Chief Domme titled "Technology for the Certification of Range Residue," [PF 21012.2].

PRO-ACT then contacted Lieutenant Colonel (Lt Col) Tom Dombrowsky, Explosive Ordnance Disposal (EOD), Headquarters Air Force Civil Engineer Support Agency (HQ AFCESA/EOD), DSN 523-6410, who stated he is not aware of any testing of munition residue for hazardous waste characteristics. He stated that he has been working with Mr. Marty Faile, Environmental Quality Directorate, Headquarters Air Force Center for Environmental Excellence (HQ AFCEE/EQ), DSN 240-4217, to establish a memorandum of agreement for the two agencies to work together in an effort to determine a method of analysis, characterization, and disposal that meets both explosive safety and environmental concerns.

We also spoke with Master Sergeant Gordon Hull, Munitions Maintenance, Hill AFB, DSN 777-0315, who stated that he is not aware of any environmental analysis being conducted on practice munitions prior to disposal. He stated that munitions must be rendered inert in accordance with EOD 5X treatment standards. This involves heating of the munition at a temperature of 460 degrees F, which will burn off any residue left from the spotting charges.

PRO-ACT next spoke with Mr. Jim Vincent, Program Manager for Range Cleanup and Munitions Disposal, Versar Inc, Nellis AFB, (702) 653-4994. Mr. Vincent stated that after the munition has been rendered inert there is not enough residue left to test. He further stated he is not aware of anyone who is testing spotting charge residue for hazardous waste characteristics. At Nellis AFB, the munition is "flashed" in an incinerator to burn-off any residue left over from the spotting charges. After that process, the munition may then be demilitarized and recycled as scrap metal.

Finally, we spoke with Mr. Marty Faile, HQ AFCEE/EQ, who stated that he is working with the Army Environmental Center and its support contractors on several demonstration projects related to munitions disposal/recycling. He stated that the most promising is a pilot program where a contractor has developed a portable "flashing" unit that can be installed at your location. He suggests that you call him directly for additional information for possible alternatives to your current method of disposal.

Question #2

Ms. Rosanna Bandemehr, HQ DRMS/SOM, further stated that there are specific demilitarization requirements for these items that must be completed prior to turn-in. She stated these requirements are contained in the Department of Defense (DoD) 4160.21-M-1, "Demilitarization Codes to be Assigned to Federal Supply Items and Coding Guidance," Appendix 3, Paragraph E.12 on page A4-24, "Method and Degree of Demilitarization: Inert Loaded Projectiles, Warheads and Similar Items of All Types," enclosed [PF 21012.1]. This document indicates inert bombs filled with concrete can be turned into DRMOs after demilitarization by exposing the inert filler. This can be accomplished by removal of the fuse well from the cavity, removal of base plates, or by puncturing/drilling holes in the bomb casing.

We also contacted Mr. Jim Yenney, Demilitarization Technical Office, Army Defense Ammunition Center and School, DSN 585-8297, who stated your DRMO should accept the practice bombs if munitions personnel certify they are inert. This can be done via a signed statement on the turn-in form.

PRO-ACT next reviewed the Munitions Items Disposition Action System (MIDAS) website for information on your specific munitions. The MIDAS Program was established in November 1992 to identify disposal and recycling alternatives, and to provide a central source of demilitarization and disposal information for unwanted munition items.

We spoke with Mr. Tyrone Nordquist, MIDAS Program Manager, (918) 420-8144. Mr. Nordquist stated he would like to discuss your request with you directly, as there are many technical aspects to disposal technologies for these practice munitions.

In summary, PRO-ACT contacted munitions disposal experts throughout the Air Force and did not locate any instance where properly demilitarized munitions had been evaluated for hazardous waste characteristics prior to disposal. The consensus among the experts we contacted was that the demilitarization process involves incineration of any chemical residue remaining within the munitions. This process does not leave enough residue material available for collection and completion of a hazardous determination. However, work is being performed by HQ AFCEE and HQ AFCESA to develop a standard analysis, characterization, and disposal protocol to ensure both environmental and EOD requirements are jointly met in future munitions disposal activities. Mr. Marty Faile of HQ AFCEE/EQ requested you contact him directly for further guidance. Additionally, Mr. Tyrone Nordquist, MIDAS Program Manager, requested you contact him so that he may assist you in determining the proper handling and

disposal procedures for your munitions. Finally, PRO-ACT cautions that prior to burying any munitions on-site, you must conduct a hazardous waste determination on the munitions in accordance with Title 40 Code of Federal Regulations Part 261. Even though the munitions residue on the munitions may have been incinerated, any metals or paints remaining on the munitions may still cause the waste to be characterized as hazardous. However, if you apply the appropriate demilitarization procedures, you may take advantage of the recyclable material's exemption found at Title 40 CFR 261.6, "Requirements for Recycled Materials."

Sincerely,

[Original Signed]

Kenneth Bishop
PROACT Researcher

:21012

Information current as of publication date, for up-to-date information contact PROACT.

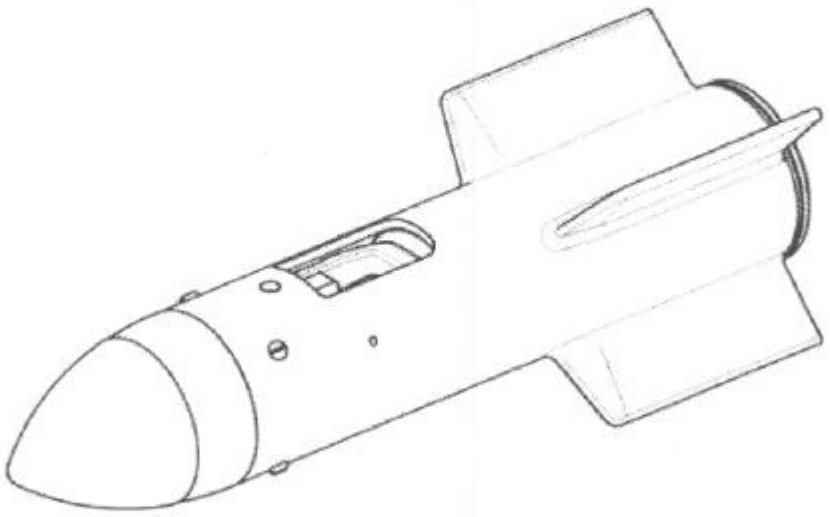
APPENDIX C – POTENTIAL BDU-33 REPLACEMENT

PTD 1191/702
Issue 1
January 2001

BOMB AIRCRAFT PRACTICE 3 kg No 3 Mk 52

(Hot spotting charge - Smoke & Flash)

GENERAL AND TECHNICAL INFORMATION
GENERAL ORDERS AND MODIFICATIONS
PREPARATION SCHEDULES
PACKAGING



Prepared by Technical Publications,
Portsmouth Aviation Limited
The Airport, Portsmouth, PO3 5PF,
England, UK

PORTSMOUTH AVIATION

LETHAL WARNINGS

AIRCRAFT BOMBS AND ASSOCIATED EQUIPMENT

AIRCRAFT BOMBS AND ASSOCIATED EXPLOSIVES COMPONENTS, EQUIPMENTS ASSOCIATED WITH AIRCRAFT BOMBS (e.g. BOMB RACKS) AND THEIR ASSOCIATED EXPLOSIVES COMPONENTS, ARE A POTENTIAL SOURCE OF DANGER. INADVERTENT OPERATION CAN CAUSE SERIOUS, AND POSSIBLE FATAL, INJURIES. SAFETY DEVICES ARE TO BE FITTED AT ALL TIMES, EXCEPT WHEN REMOVAL IS AUTHORISED.

SAFETY PRECAUTIONS

1 **Practice bombs must always be handled using due care.**

a. The Ground Safety Pin is not to be removed from the assembled bomb unless detailed in the relevant schedule.

b. The Ground Safety Pin must be refitted on aircraft return and before the bomb is removed from a Bomb Rack (SUU-20 or TER-9).

CAUTION

The nose cone fitted to the nose assembly is fragile and care must be taken not to crack or otherwise damage it during handling, fitting or removal.

SECTION 1

GENERAL AND TECHNICAL INFORMATION

CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Length	approx 386 mm
Diameter	approx 76 mm
Diameter across fins	approx 153 mm
Mass, filled	approx 3.3 kg
Percussion cap	Winchester 209 percussion cap
Main spotting charge (Smoke and Flash)	4 g composition SR800 - magnesium powder grade 5, 42% - acaroid resin size 120, 8% - potassium perchlorate size 120, 50% 13 g magnesium powder grade 0

INTRODUCTION

1 The 3 kg No 3 Mk 52 smoke and flash practice bomb is designed for use in practicing those delivery techniques adopted for the 500 lb Mk 82 bomb with slick tail. The spotting charge produces smoke and flash on impact.

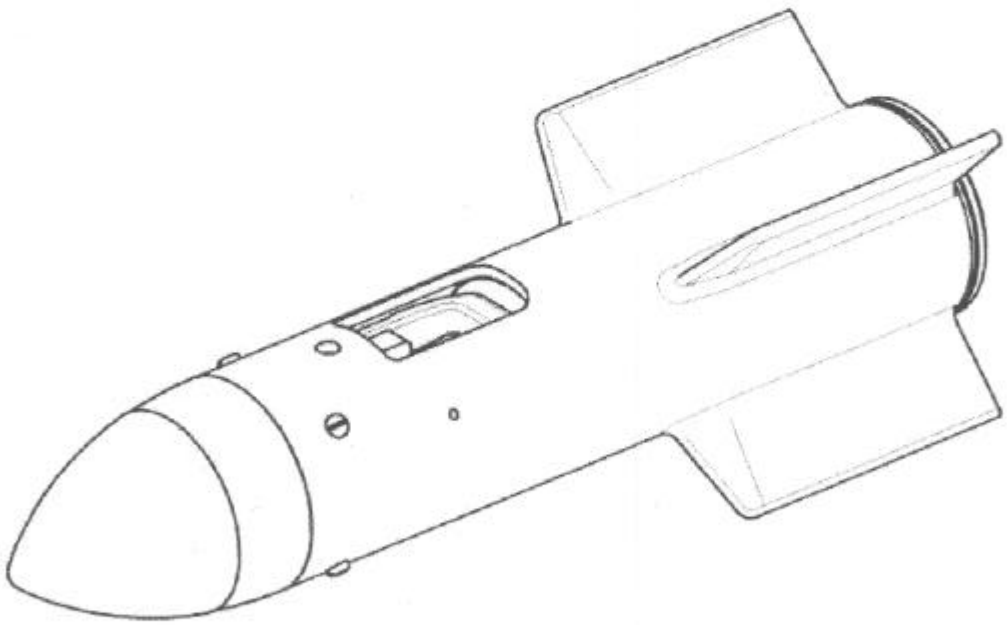


Fig 1 - General view of 3 kg Practice Bomb - safety/suspension lug lowered

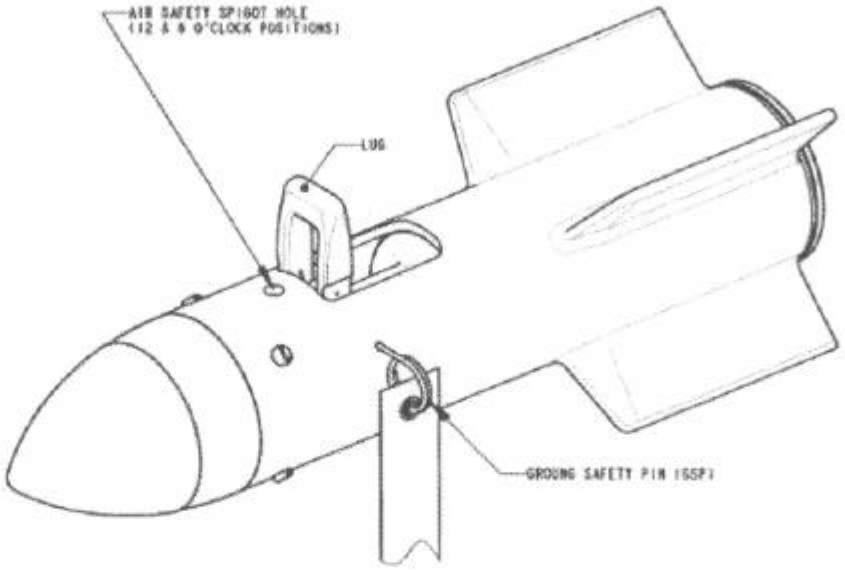


Fig 2 - General view of 3 kg Practice Bomb - safety/suspension lug raised
(Orientation for attachment to TER-9)

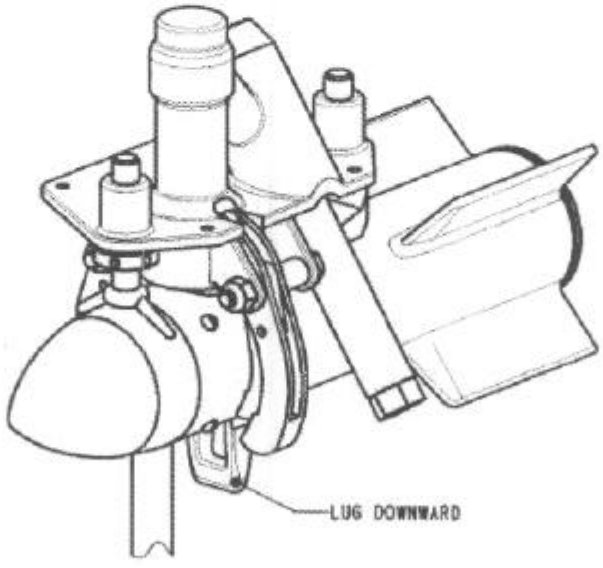


Fig 3 - General view of 3 kg Practice Bomb inverted - safety/suspension lug raised
(Orientation for attachment to SUU-20)

2 The 3 kg practice bomb may be carried and released from the TER-9 rack, or from a SUU-20:

2.1 When used on the TER-9, the practice bomb is fitted with its safety/suspension lug in the raised position (12 o'clock), and suspended from the jaws on the rack by the safety/suspension lug, with a ground safety pin (GSP) fitted (see Fig 2).

2.2 When used on the SUU-20, the bomb is fitted inverted, i.e. safety/suspension lug at the 6 o'clock position, with the bomb being gripped by the caliper type suspension system. The safety/suspension lug is placed in the raised position (although the store is inverted) with a ground safety pin fitted (see Fig 3).

3 The practice bomb is so designed that on impact the smoke and flash signal is emitted through the open end of the body. The spotting charge is prevented from being initiated after preparation, and whilst attached to a bomb rack, by the raised safety/suspension lug preventing forward movement of the cartridge assembly. The safety/suspension lug is restrained in its raised position by a ground safety pin (see Fig 2). Upon removal of the GSP, the lug is retracted by a torsion spring.

DESCRIPTION

4 The 3 kg practice bomb consists of three main assemblies, a body, a nose assembly and nose cap, and a cartridge assembly.

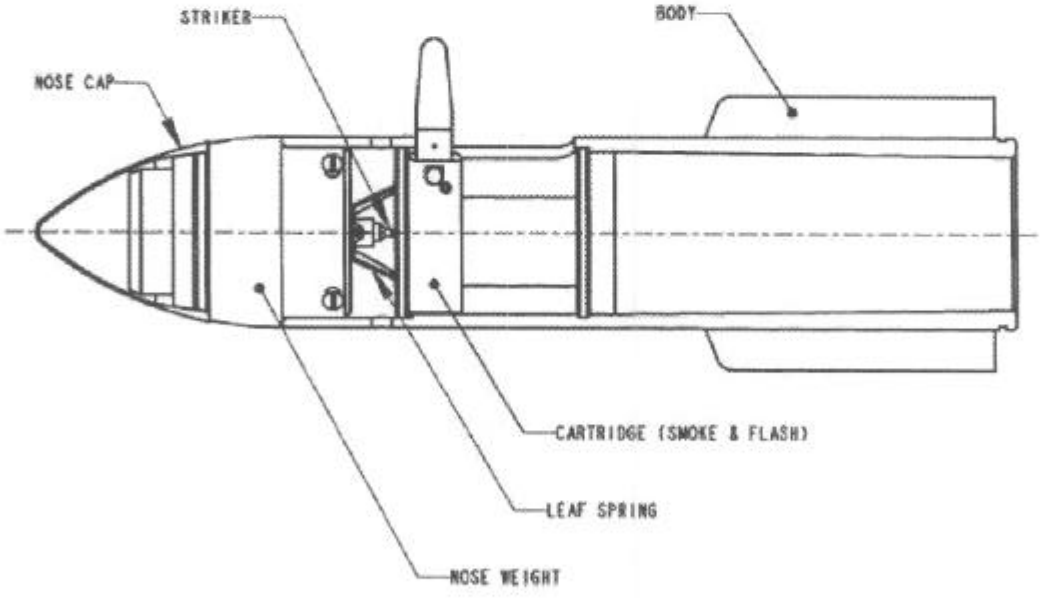


Fig 4 - Internal drawing of 3 kg Practice Bomb

Body

5 The bomb comprises a cylindrical Dough Moulded Composite (DMC) plastic tube with four external integrally moulded stabilising fins at the rear. Holes in the body wall are for the nose securing screws, the ground safety pin (GSP) and the air safety spigot.

6 The wall of the body is thicker at the rear section than the forward section and the step which this provides is used to locate, and restrain rearward movement of, the cartridge assembly. The GSP passes through a hole in the wall of the cartridge assembly and locates in the cartridge assembly when the safety/suspension lug is the raised position; the GSP will not fit when the safety/suspension lug is lowered.

7 Located on the same axis as the safety/suspension lug is the hole in which the air safety spigot is inserted as the bomb is loaded to the rack. The spigot is an integral fitting on the Piston Foot of the SUU-20 and the adaptor shoe on the TER-9 rack, and it prevents forward movement of the cartridge assembly whilst the bomb is loaded on the rack.

8 For carriage and release from the TER-9 rack, the bomb is fitted with a retractable safety/suspension lug. This lug is attached directly to the cartridge assembly (see Fig 5 and 6) and carries out a dual function.

9 In the raised position, it provides a suspension lug facility so that the bomb may be suspended from the jaw of the TER-9; it also prevents forward movement of the cartridge assembly. When the practice bomb is fitted inverted to a caliper type suspension system (SUU-20), the raised lug still provides ground safety.

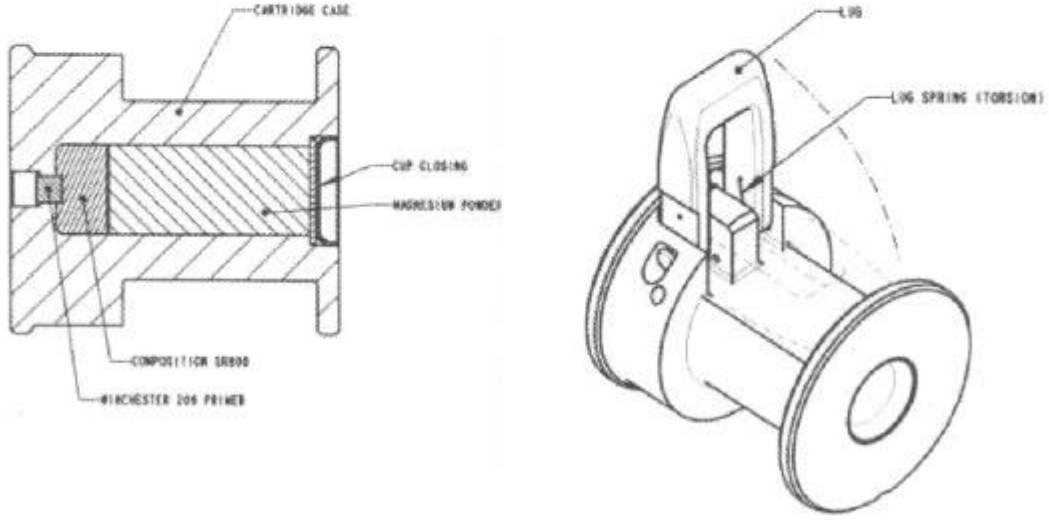


Fig 5 - Cartridge Housing (smoke and flash) showing suspension lug details

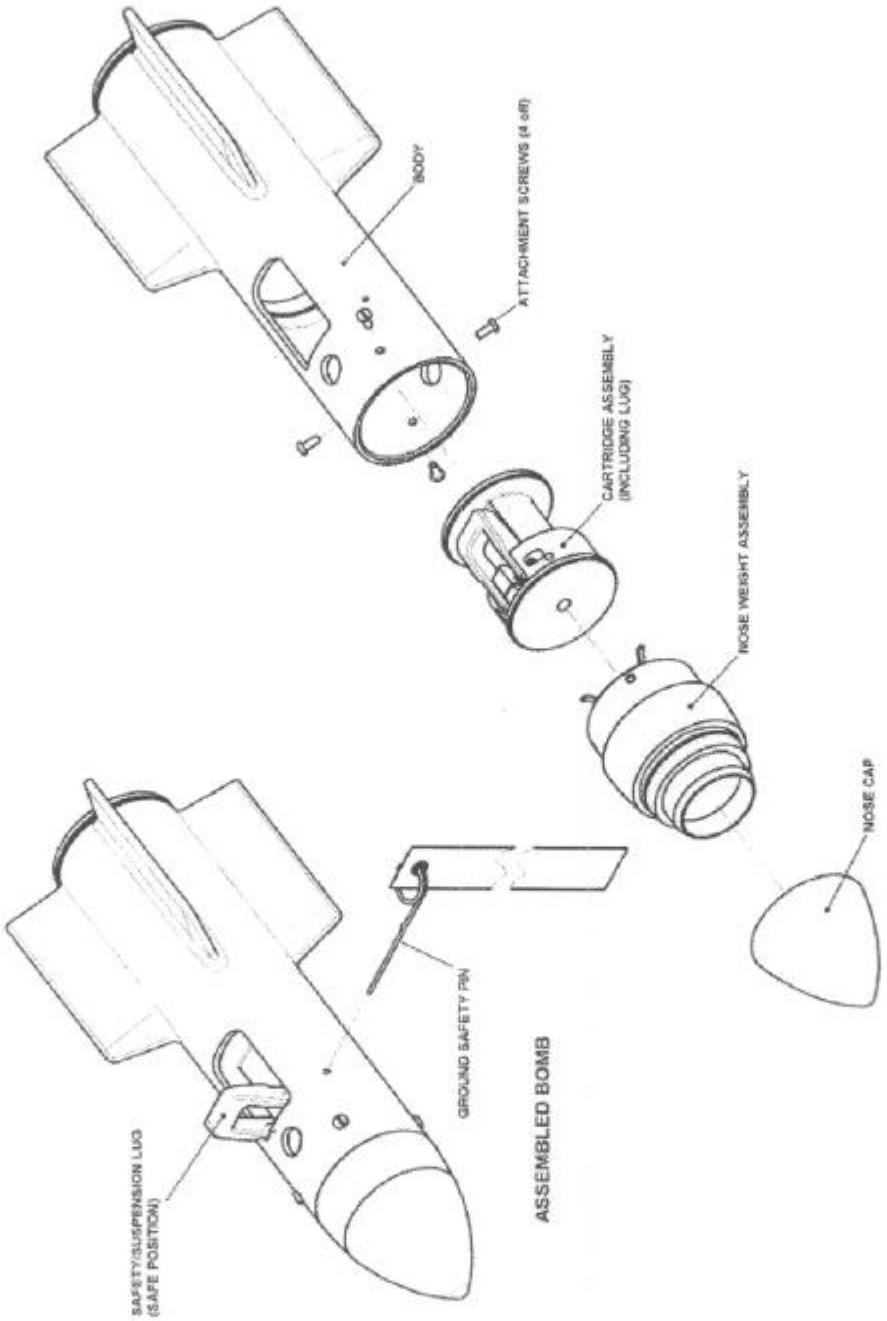


Fig 6 - Assembled and Exploded view of 3 kg Practice Bomb including GSP

Nose assembly

CAUTION

The nose cone fitted to the nose assembly is fragile and care must be taken not to crack or otherwise damage it during handling, fitting or removal.

10 The nose assembly is a heavy solid steel plug which closes the front end of the body. Its forward end is cupped internally to assist in the retardation of the bomb on impact, and tapered externally. A frangible nose cap is attached to the tapered section. A cannelure has been machined around the tapered section of the nose into which moulded nibs locate to retain the nose cap. Should the nose cap be broken during transportation or handling a new cap can be fitted in accordance with paragraph 27.

11 The rear face of the nose weight is centrally drilled and tapped to receive the fixed striker. A three-prong leaf spring, locked by the striker, prevents the cartridge assembly sliding forward unless the bomb has been subjected to a rapid longitudinal deceleration. The 'g-force' required to overcome the three-prong spring is 50 g. Around the rear perimeter of the nose are 4 tapped holes for the securing screws.

Cartridge Assembly

13 The cartridge assembly is a die-cast aluminium alloy component, attached to which is a retractable steel safety/suspension lug.

Cartridge

12 The 70 mm (2.76 in) long cylindrical cartridge is 26 mm (1.02 in) in diameter and incorporates a percussion cap at one end and an aluminium closure disc at the other to retain the smoke and flash composition. The cartridge gives a flash and white smoke on practice bomb impact.

IDENTIFICATION MARKINGS

14 The bomb is pigmented deep saxe blue overall. A 19 mm wide band, middle brown in colour to indicate that the bomb is a low explosive hazard, is painted around the nose assembly. The nose cap is black. Other markings are printed in white on the body. See also para 19.

FUNCTIONING

15 TER-9 rack role

15.1 The bomb is received from preparation with the safety/suspension lug raised and the GSP fitted.

15.2 The bomb is loaded to the rack (in accordance with current aircraft loading schedules) with the safety/suspension lug in the 12 o'clock position, the GSP installed, and with the air safety spigot located in its hole in the bomb body. The air safety spigot is an integral part of the adaptor shoe on the TER-9 rack.

15.3 Before take-off of the aircraft, the GSP is removed from the bomb.

15.4 On release of the bomb from the rack, it disengages from the air safety spigot, and the safety/suspension lug retracts into the bomb body under the influence of the torsion spring. During the bomb's descent the three-prong spring holds the cartridge assembly away from the striker.

16 SUU-20 and Bomb Dispenser role

16.1 The bomb is received from preparation with the safety/suspension lug raised and the GSP fitted.

16.2 The bomb is loaded to each rack (in accordance with current aircraft loading schedules) inverted with the safety/suspension lug in the 6 o'clock position.

16.2 Before take-off of the aircraft, the GSP is removed from the bomb, and the safety/suspension lug retracts into the bomb body under the influence of the torsion spring.

16.3 On release of the bomb, and during the bomb's descent, the three-prong spring holds the cartridge assembly away from the striker.

17 On target impact of the practice bomb:

17.1 The black nose cap shatters

17.2 The cupped nose assembly retards forward movement of the bomb

17.3 The inertia of the cartridge assembly overcomes the three-prong spring and drives the percussion cap on to the striker.

17.4 The flash from the percussion cap fires the boost charge, which ignites and expels the main pyrotechnic filling through the open end of the body.

SAFETY DEVICES

18 The following safety devices are fitted to the munition:

18.1 A three-prong leaf spring, locked by the striker, prevents the cartridge assembly sliding forward unless the bomb has been subjected to a rapid longitudinal deceleration. The 'g-force' required to overcome the three-prong spring is 50 g.

18.2 The safety/suspension lug in the raised position prevents the forward movement of the cartridge assembly. The safety/suspension lug is prevented from retracting into the body of the bomb during ground handling by a ground safety pin (GSP), to ensure safety in all handling aspects. A red warning pennant is attached to the GSP and has the following instruction in white lettering on one side: REMOVE BEFORE FLIGHT.

Note . . .

The munition is shipped with the safety/suspension lug in the raised position and the GSP installed.

SAFETY PRECAUTIONS

20 Practice bombs must always be handled using due care. The safety pin is not to be removed until the bomb is correctly attached to a bomb rack. The safety pin must be refitted before the bomb is removed from a bomb rack.

Note . . .

The nose cone fitted to the nose assembly is fragile and care is to be taken not to crack or otherwise damage it during handling. The nose cap may, however, be replaced - see para 27 for details.

PACKAGING

21 Information concerning the package, and method of packaging, for the practice bomb is contained in Section 5 of this document.

MUNITION PREPARATION

22 The practice bomb is to be prepared for use as detailed in Section 3.

LOADING

23 The practice bomb is to be attached to, and removed from, the appropriate bomb rack as detailed in the appropriate Aircraft Maintenance Manual.

OFF-LOADING

24 The bomb is to be off-loaded from SUU-20 type racks as follows:

24.1 Raise the safety/suspension lug out of the bomb body and install the GSP.

Note . . .

If the safety/suspension lug is not fully raised, the GSP will not fit.

24.2 Manually remove the bomb from the rack as detailed in the appropriate Aircraft Maintenance Manual.

25 The bomb is to be off-loaded from TER-9 type racks as follows:

25.1 Fit the GSP.

25.2 Manually remove the bomb from the rack as detailed in the appropriate Aircraft Maintenance Manual.

PREPARATION FOR RETURN TO STORAGE

26 The bomb is to be prepared for return to storage as detailed in Section 4.

REPLACEMENT OF BROKEN NOSE CAP

27 The procedure to replace a broken nose cap on a bomb is as follows:

27.1 Ensure the safety/suspension lug is in the raised position and that the safety pin is securely fitted.

27.2 Stand the bomb on its base on a firm surface.

27.3 Wearing suitable protective work gloves, carefully break and remove the broken nose cap from the nose assembly.

27.4 Examine the nose weight assembly.

27.5 Locate the new cap on the nose weight assembly and push it fully home.

27.6 Ensure the cap is securely held on the nose assembly.

APPENDIX D – SUSTAINABILITY MATRIX

Appendix

D

Sustainability Matrix

D. Background

The Sustainability Matrix was developed to assist operators, designers, and managers of BDU-33 target areas. It is a quick reference tool that can be used to help highlight specific areas of concern surrounding range and target development. It is envisioned that this tool will be used during the early phases of target siting, design, construction, and operation. The matrix is an extract from the various chapters of the BDU-33 Target Design Guidebook. The text in the Guidebook offers further details on the critical issues and considerations surrounding the development and sustainment of target and associated range areas.

It is important to note that both the Guidebook and the Matrix assume that all the mission requirements have been made and properly identified prior to target design or site selection. Therefore, discussions focus on site or design modifications that can be used to enhance the target sustainability, not on modifying mission parameters. In a very few cases suggestions are made as to the time of year or day a mission can be conducted in order to minimize adverse impacts. However, if, for example, a mission dictates a twilight or cold weather requirement, then recommended variance or mitigative measures would not apply.

D.1 Matrix Evaluation Criteria

The matrix is divided into the following 13 broad categories that impact target and range sustainability:

1. Earth Resources
2. Wildlife
3. Plants
4. Land Resources
5. Water Resources
6. Air Resources
7. Climate
8. Noise and Vibration

9. Visual Resources
10. Cultural/Archaeological Resources
11. Socioeconomics
12. Public Relations
13. Transport Systems
14. Operations and Maintenance

Each of these criteria is then subdivided into specific issues affecting construction, operation/sustainment, or closure. The specific considerations of these issues that may impact the target area are then subsequently identified. It is in this area that users should examine and weigh options in relation to their specific target needs. The matrix is designed to be universal; however, it must be understood that site-specific considerations will vary and some judgment will be required when examining these considerations in relation to the user's target area. The discussion provided in these sections is designed only to offer a perspective of general concerns.

D.2 Variances or Mitigative Measures

In some cases the user may be able to implement actions that reduce the negative impacts associated with each critical issue. In these cases the matrix offers alternatives to aid users in identifying mechanisms that will help them overcome specific considerations impacting their design, construction, or target operations. The alternatives are designed to stimulate thought and should not be considered the only options available. Additionally, the discussions in this area attempt to identify appropriate regulations or Air Force Instructions that may assist the user in implementing any mitigative measures. In some cases these areas are left blank because there is no logical suggestion.

SUSTAINABILITY MATRIX

3. Earth Resources

3.1 Geographic Location

3.1.a. Does the size of the land and airspace meet mission requirements?

Land and airspace area must meet mission requirements. Weapon systems requiring long-range standoff will naturally require more area.

Yes ➡ **Continue to 3.1.b**

No ➡ Can a variance or mitigative measures be applied?

Future uses should be anticipated that might alter size requirements. By working with weapon planners and local developers, future incompatibilities can be minimized. Involve local community leaders, planners, and zoning boards to create easements and buffer zones around range.

Yes ➡ **Continue to 3.1.b**

No ➡ Site is unsatisfactory

3.1.b. Is the weapon safety footprint compatible with the selected location?

Weapon safety footprint orientations must be compatible with buffers, land, air, and waterway uses.

Yes ➡ **Continue to 3.1.c**

No ➡ Can a variance or mitigative measures be applied?

Ensure land, air, and water assets have the flexibility to meet long-term mission requirements that might affect existing and future weapon safety needs.

Yes ➡ **Continue to 3.1.c**

No ➡ Site is unsatisfactory

3.1.c. Are impacts to existing targets or military operations minimized?

Locations of existing targets may interfere with the proposed site of a new target.

Yes ➡ **Continue to 3.1.d**

No ➡ Can a variance or mitigative measures be applied?

Consider inactivating or relocating a target, or adjusting target use schedules.

Yes ➡ **Continue to 3.1.d**

No ➡ Go to Risk Management Considerations at end of matrix.

3.1.d. Has the topography been evaluated for its impacts on O&M requirements?

Topography can impact the user's ability to access and maintain a target; however, mission needs may require training in such environments.

Yes ➡ **Continue to 3.1.e**

No ➡ Can a variance or mitigative measures be applied?

Consider adjusting or designing targets so as to minimize O&M requirements. May incur increased costs for maintenance and closure.

Yes ➡ **Continue to 3.1.e**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

3.1.e. Is the proposed target area not easily accessible by unauthorized personnel?

Accessibility of the proposed target area will impact safety, security, and O&M of target areas.

Yes ➡ **Continue to 3.2.a**

No ➡ Can a variance or mitigative measures be applied?

Identify potential access routes in and on target area, and their anticipated uses early in the design process. Consider adding buffers, fencing, and security to minimize unauthorized access.

Yes ➡ **Continue to 3.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

3.2 Air Corridors

3.2.a. Is air space use optimized?
FAA Directives require that the military accommodate the maximum number of operations in existing airspace and limit the proliferation of new airspace.

Yes ➡ **Continue to 3.3.a**

No ➡ Can a variance or mitigative measures be applied?

Users must ensure they comply with AFIs 13-201, 32-7061, and applicable FAA Directives.

Yes ➡ **Continue to 3.3.a**

No ➡ Site is unsatisfactory

3.3 Environmental Baseline

3.3.a. Has an environmental baseline been established?

Analysis and documentation of existing environmental resources (e.g., groundwater, surface water, air, land, natural, cultural) to evaluate long-term or future impacts. An attempt should be made to collect the described information and to identify any pre-existing environmental or industrial condition prior to acquisition or development.

Yes ➡ **Continue to 3.3.a**

No ➡ Conduct baseline assessment.

Site has no pre-existing conditions that will adversely affect mission requirements.

Yes ➡ **Continue to 3.3.a**

No ➡ An environmental baseline must be established. Return to 3.3.a.

3.4 Soil Structure

3.3.a. Is the soil structure compatible with mission requirements?

Range use will dictate whether soils must be highly compacted to hold the weight of large vehicles or targets. Loose soil may instead be needed to minimize ricochet.

Yes ➡ **Continue to 3.5.a**

No ➡ Can a variance or mitigative measures be applied?

Are engineering controls required/practical to limit ordnance penetration, or to enhance soil structure? Consider use of softened/salvaged vehicle for a target.

Yes ➡ **Install engineering controls Continue to 3.5.a**

No ➡ **Continue to 3.5.a**

3.5 Ground Cover

3.5.a. Is the ground cover compatible with mission requirements?

Ground cover can act as a soil stabilizer to reduce erosion risks. However, native plant species must be considered when choosing ground cover to minimize impacts to the local ecosystem.

Yes ➡ **Continue to 3.6.a**

No ➡ Can a variance or mitigative measures be applied?

If native species cannot be used consider engineering or natural controls when using alternative species. If environment cannot support natural ground cover, consider engineering controls such as geotextiles.

Yes ➡ **Use ground cover Continue to 3.6.a**

No ➡ **Continue to 3.6.a**

SUSTAINABILITY MATRIX

3.6 Sedimentation

3.6.a. Are targets located away from water bodies?

Locate targets away from rivers, creeks, and other water bodies to reduce the risk of sedimentation, unless otherwise dictated by mission requirements (e.g., the need for bridge or coastal zone targets). Sedimentation is a transport mechanism for UXO constituents.

Yes ➡ **Continue to 3.7.a**

No ➡ Can a variance or mitigative measures be applied?

Engineering controls should be evaluated to avoid sedimentation of local water bodies. A periodic monitoring program may be required.

Yes ➡ **Continue to 3.7.a**

No ➡ Go to Risk Management Considerations at end of matrix.

3.7 Stability

3.7.a. Are targets located away from steeply sloped areas?

Targets should not be located in a steeply sloped area because of erosion, sedimentation, and target maintenance and UXO clearance concerns. (Unless dictated by mission requirements.)

Yes ➡ **Continue to 3.8.a**

No ➡ Can a variance or mitigative measures be applied?

If required by mission, then evaluate engineering controls to limit erosion (e.g., natural ground cover, riprap, fencing) and consider targets that require less maintenance.

Yes ➡ **Continue to 3.8.a**

No ➡ Go to Risk Management Considerations at end of matrix.

3.8 Erosion

3.8.a. Are soil conditions evaluated to ensure minimum erosion concerns?

Targets should not be located in an area where soil, water, and ground cover will be adversely affected by erosion.

Yes ➡ **Continue to 3.9.a**

No ➡ Can a variance or mitigative measures be applied?

Evaluate best management practices that reduce soil loss due to erosion (e.g., straw bales, silt fences, native ground cover).

Yes ➡ **Continue to 3.9.a**

No ➡ Go to Risk Management Considerations at end of matrix.

3.9 Brush Control

3.9.a. Is brush or local vegetation compatible with range or target needs?

Brush piles created during area clearing creates a fire hazard. Brush growing around a target area should be managed in a way to minimize fire hazards, potential habitat for unwanted wildlife, and maintenance concerns.

Yes ➡ **Continue to 4.1.a**

No ➡ Can a variance or mitigative measures be applied?

Consider using brush control or other maintenance options to minimize potential hazards.

Yes ➡ **Remove the brush piles Continue to 4.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

4. Wildlife

4.1 Threatened and Endangered Species

4.1.a. Has the range area been evaluated for threatened or endangered species and can potential impacts be avoided?

Required by law, the area must be evaluated for the presence of federal and state listed T&E species. Coordination must take place with the local U.S. Fish and Wildlife Service.

Yes ➡ **Continue to 4.2.a**

No ➡ Can a variance or mitigative measures be applied?

Relocate target area or upon consultation with USFWS, locate a target area and provide adequate mitigating measures for species of concern. Also evaluate the potential for an Incidental Take Permit.

Yes ➡ **Continue to 4.2.a**

No ➡ Site is unsatisfactory

4.2 Critical Habitat

4.2.a. Has the area been ruled out as a critical habitiat?

USFWS must be contacted/coordinated with if there are plans to conduct or permit an activity involving the impoundment, diversion, deepening, control, or modification of a stream or body of water or any time an activity is planned in an area designated as a Critical Habitat in the Federal Register.

Yes ➡ **Continue to 4.3.a**

No ➡ Can a variance or mitigative measures be applied?

Coordinate with government agencies to mitigate the impact of private or commercial development (e.g., encroachment, logging, commercial development) by creating "habitat islands" on target areas and buffer zones for T&E species.

Yes ➡ **Continue to 4.3.a**

No ➡ Site is unsatisfactory

4.3 Wildlife Management

4.3.a. Can wildlife be managed so that it does not adversely impact mission requirements?

Manage wildlife so they do not adversely impact mission or O&M requirements.

Yes ➡ **Continue to 4.3.b**

No ➡ Can a variance or mitigative measures be applied?

Locate training areas away from water bodies and migratory bird flyways (e.g., minimize Bird Aircraft Strike Hazards (BASH)).

Yes ➡ **Continue to 4.3.b**

No ➡ Go to Risk Management Considerations at end of matrix.

4.3.b. Are migratory or breeding areas avoided?

During certain seasons, a target area may not be accessible due to the location of breeding grounds for T&E species or because of migratory pathways.

Yes ➡ **Continue to 5.1.a**

No ➡ Can a variance or mitigative measures be applied?

Training areas should be located away from water bodies, feeding, nesting areas, and animal migratory paths. If not possible due to mission requirements, consider modifying mission parameters during the affected seasons. However, during these periods of downtime, other maintenance operations can be conducted.

Yes ➡ **Continue to 5.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

5. Plants

5.1 Threatened and Endangered Species

5.1.a. Has the range area been evaluated for threatened or endangered species and can potential impacts be avoided?

Required by law, the area must be evaluated for the presence of federal and state listed T&E species. Coordination must take place with the local U.S. Fish and Wildlife Service.

Yes ➡ **Continue to 5.2.a**

No ➡ Can a variance or mitigative measures be applied?

Relocate target area or upon consultation with USDA, if a target area is allowed, provide adequate buffer areas from species of concern.

Yes ➡ **Continue to 5.2.a**

No ➡ Site is unsatisfactory

5.2 Vegetation Management

5.2.a. Has the target area natural vegetation been evaluated for impact on mission?

Vegetation in the target area should be managed to the extent that operations can take place. Vegetation can be beneficial in controlling erosion.

Yes ➡ **Continue to 5.2.b**

No ➡ Can a variance or mitigative measures be applied?

Ensure the use of non-native plants are minimized in order to prevent problems with invasive species and adverse impacts on local or native flora.

Yes ➡ **Continue to 5.2.b**

No ➡ Go to Risk Management Considerations at end of matrix.

5.2.b. Is vegetation adequate to meet mission requirements?

Some training missions may require enhanced vegetation for tactical cover.

Yes ➡ **Continue to 5.3.a**

No ➡ Can a variance or mitigative measures be applied?

Ensure the use of non-native plants is minimized in order to prevent problems with invasive species and adverse impacts on local or native flora.

Yes ➡ **Enhancement required Continue to 5.3.a**

No ➡ **Continue to 5.3.a**

5.3 Fire Controls

5.3.a. Have fire controls been considered?

Vegetation should be managed to minimize fire hazards.

Yes ➡ **Continue to 6.1.a**

No ➡ Can a variance or mitigative measures be applied?

Consider fire breaks or other vegetation controls in design and O&M. Adjust to use CXU-series cartridges.

Yes ➡ **Continue to 6.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

6. Land Resources

6.1 Open Space/Buffer Zones

6.1.a. Are adequate buffer zones available?

Buffer zones enhance mission safety, security, and natural resources.

Yes ➡ **Continue to 6.2.a**

No ➡ Can a variance or mitigative measures be applied?

Buffer areas may be improved by enhancing with engineering controls.

Yes ➡ **Continue to 6.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

6.2 Exposure to UXO

6.2.a. Have safe separation distances been established between potential UXO areas and the public?

Target areas should be surrounded by adequate open space/buffer areas to ensure security and provide for explosive safety. Buffer zones provide a safety area from sensitive receptors (e.g., schools, homes, hospitals). (Reference applicable safety regulations.)

Yes ➡ **Continue to 6.2.b**

No ➡ Can a variance or mitigative measures be applied?

No part of the weapon safety footprint should leave government-controlled areas.

Yes ➡ **Continue to 6.2.b**

No ➡ Go to Risk Management Considerations at end of matrix.

6.2.b. Are sensitive receptors adequately protected from UXO?

Schools, homes, and hospitals should be located a safe distance from areas potentially containing UXO.

Yes ➡ **Continue to 6.3.a**

No ➡ Can a variance or mitigative measures be applied?

No part of the weapon safety footprint should leave government-controlled areas.

Yes ➡ **Continue to 6.3.a**

No ➡ Site is unsatisfactory

6.3 Recreation

6.3.a. Have safety and security of nearby recreational activities been considered?

During specific times of the year, certain areas of the range or nearby properties could be opened to the public for hunting, fishing, hiking, swimming, and biking. Safety and security must be evaluated and impacts on these activities considered ahead of time.

Yes ➡ **Continue to 6.4.a**

No ➡ Can a variance or mitigative measures be applied?

Commanders must understand the liabilities associated with recreational activities and these activities should be weighed against operational requirements.

Yes ➡ **Continue to 6.4.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

6.4 Agriculture/Compatible Use

6.4.a. Are targets located away from Prime and Unique Farmlands?

Proposed target areas should be evaluated for proximity to areas designated as Prime and Unique Farmland by the U.S. Department of Agriculture (USDA).

Yes ➡ **Continue to 6.4.b**

No ➡ Can a variance or mitigative measures be applied?

Prime and Unique Farmlands should be avoided to the extent possible. If no other alternatives are available, coordination with USDA is required prior to impacting the area.

Yes ➡ **Continue to 6.4.b**

No ➡ Site is unsatisfactory

6.4.b. Have range areas been evaluated for free-range practices?

It may be appropriate to allow free-range use for domesticated animals (e.g., grazing).

Yes ➡ **Continue to 6.4.c**

No ➡ Can a variance or mitigative measures be applied?

Appropriate agreements with the Bureau of Land Management must be in place prior to land use.

Yes ➡ **Continue to 6.4.c**

No ➡ Do not allow free-range activities.

6.4.c. Have range areas been evaluated for compatible agriculture uses?

Consideration should be given to proposed range areas for potential planting and harvesting practices. Proper forestry practices should be implemented when clear cutting areas.

Yes ➡ **Continue to 6.4.d**

No ➡ Can a variance or mitigative measures be applied?

Clear cutting of an area or winter tilling of soil may cause unwanted soil erosion and sedimentation problems.

Yes ➡ **Continue to 6.4.d**

No ➡ Do not allow agriculture activities.

6.4.d. Have range areas been evaluated for compatible mining/energy development uses?

Consideration should be given to proposed range areas for potential mining or energy development (e.g., drilling) activities.

Yes ➡ **Continue to 6.5.a**

No ➡ Can a variance or mitigative measures be applied?

Ensure activities are compatible with mission requirements and do not cause adverse environmental impacts. Coordination with Department of Interior (DOI) is required prior to the initiation of mining activities.

Yes ➡ **Continue to 6.5.a**

No ➡ Do not allow mining or energy development activities.

SUSTAINABILITY MATRIX

6.5 Residential

6.5.a. Have current and potential residential areas been identified and evaluated for impacts on mission requirements?

Targets should be located a safe distance from residential areas or potential residential developments.

Yes ➡ Continue to 6.5.b

No ➡ Can a variance or mitigative measures be applied?

Early public participation during design and siting process is highly recommended. Additionally, government agencies should actively participate in zoning and future area development plans.

Yes ➡ Continue to 6.5.b

No ➡ Go to Risk Management Considerations at end of matrix.

6.5.b. Have new sortie routes been evaluated for impacts to residential areas?

Aircraft en route to or from the range could adversely impact residential areas.

Yes ➡ Continue to 6.6.a

No ➡ Can a variance or mitigative measures be applied?

Consult with local government/planning commissions to ensure long-term viability of critical airspace. (Reference applicable AFI Regulations.)

Yes ➡ Continue to 6.6.a

No ➡ Go to Risk Management Considerations at end of matrix.

6.6 Industrial/Commercial Property

6.6.a. Are targets a safe distance from industrial areas?

Targets should be located a safe distance from industrial areas or potential commercial developments.

Yes ➡ Continue to 7.1.a

No ➡ Can a variance or mitigative measures be applied?

Early public participation during the design and siting process is highly recommended. Additionally, government agencies should actively participate in zoning and future area development plans.

Yes ➡ Continue to 7.1.a

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

7. Water Resources

7.1 Surface

7.1.a. Are targets located away from surface water?

If mission requirements dictate the need for surface water, environmental controls should be implemented to avoid potential adverse environmental impacts.

Yes ➡ **Continue to 7.1.b**

No ➡ Can a variance or mitigative measures be applied?

Baseline documentation of surface waters and floodplain conditions should be evaluated prior to design and siting.

Yes ➡ **Continue to 7.1.b**

No ➡ Go to Risk Management Considerations at end of matrix.

7.1.b. Are targets located away from wetlands?

Baseline documentation of wetlands should be evaluated prior to design and siting.

Yes ➡ **Continue to 7.1.c**

No ➡ Can a variance or mitigative measures be applied?

If the range will include a jurisdictional wetland, coordination with the Army Corps of Engineers must take place. Notice of floodplain/wetland involvement must be published in the Federal Register prior to the commencement of activities.

Yes ➡ **Continue to 7.1.c**

No ➡ Site is unsatisfactory

7.1.c. Are targets sited to not permit UXO to contaminate local surface waters?

Munitions dropped into nearby surface waters could lead to contamination issues and UXO in deeper water.

Yes ➡ **Continue to 7.2.a**

No ➡ Can a variance or mitigative measures be applied?

If mission requirements include surface water target areas, then implement a periodic monitoring program.

Yes ➡ **Continue to 7.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

7.2 Drainage

7.2.a. Are proposed target sites located to avoid contamination (e.g., UXO, debris, and chemical constituents) of local surface waters?

Improper drainage could result in the creation of standing/surface waters, and potential sources of contamination that could migrate off-site. For example, do not site the target in an arroyo.

Yes ➡ **Continue to 7.3.a**

No ➡ Can a variance or mitigative measures be applied?

If mission requirements include surface water target areas, then implement a periodic monitoring program (potential expenditure of resources).

Yes ➡ **Continue to 7.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

7.3 Groundwater

7.3.a. Are targets sited away from areas containing high groundwater levels?

Siting a range in the area of shallow groundwater increases the risk of on-site and off-site groundwater contamination.

Yes ➡ **Continue to 7.3.b**

No ➡ Can a variance or mitigative measures be applied?

If groundwater is present, implement a periodic monitoring program.

Yes ➡ **Continue to 7.3.b**

No ➡ Go to Risk Management Considerations at end of matrix.

7.3.b. Are targets sited away from sole-source aquifers?

Site must be evaluated for the presence of sole-source aquifers.

Yes ➡ **Continue to 7.4.a**

No ➡ Can a variance or mitigative measures be applied?

Avoid areas overlying sole-source aquifers. If unavoidable, a periodic monitoring program may be neccessary. In addition, engineering controls could be implemented to limit penetration of ordnance and other devices.

Yes ➡ **Continue to 7.4.a**

No ➡ Go to Risk Management Considerations at end of matrix.

7.4 Stormwater

7.4.a. Has stormwater runoff from the proposed target area been analyzed to determine whether permits may be required?

Target area may require a National Pollutant Discharge Elimination System (NPDES) permit.

Yes ➡ **Continue to 8.1.a**

No ➡ Can a variance or mitigative measures be applied?

If the target area requires modification to the hydrogeology, then a NPDES construction permit may be required.

Yes ➡ **Continue to 8.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

8. Air Resources

8.1 Air Space

8.1.a. Is adequate airspace avaliable to meet mission requirements?

Mission Training Routes to and from the sortie generation points may need to be established. Airspace volume must be adequate in size to meet mission requirements. There are significant FAA restrictions that may impact airspace use.

Yes ➡ **Continue to 8.2.a**

No ➡ Can a variance or mitigative measures be applied?

Plan for current and future use weapon requirements and coordinate all activities with FAA and local government.

Yes ➡ **Continue to 8.2.a**

No ➡ Site is unsatisfactory

8.2 Munitions Detonation

8.2.a. Has the operation been evaluated for environmental impacts resulting from particulate (dust particles greater than 10 microns) releases?

Nonattainment areas may be subject to Clean Air Act National Ambient Air Quality Standards (NAAQS).

Yes ➡ **Continue to 8.2.b**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 8.2.b**

No ➡ Site is unsatisfactory

8.2.b. Has the operation been evaluated to determine potential releases of gaseous pollutants (e.g., titanium tetrachloride and red phosphorus), trace organics (e.g., smokeless powder), and trace metals (titanium tetrachloride) and odors/noxious fumes (e.g., red phosphorus)?

Some areas may be subject to Clean Air Act NAAQS.

Yes ➡ **Continue to 8.2.c**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 8.2.c**

No ➡ Site is unsatisfactory

8.2.c. Have EPCRA TRI thresholds been accounted for?

TRI Thresholds need to be calculated to determine reporting requirements.

Yes ➡ **Continue to 8.3.a**

No ➡ Can a variance or mitigative measures be applied?

If thresholds exceed reporting requirements, reports must be recorded and generated.

Yes ➡ **Continue to 8.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

8.3 Aircraft Emissions

8.3.a. Have operations been evaluated for impacts resulting from aircraft emissions?

Some areas may be subject to Clean Air Act NAAQS.

Yes ➡ Continue to 8.4.a

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required or adjust operations (e.g., fly earlier in the day).

Yes ➡ Continue to 8.4.a

No ➡ Site is unsatisfactory

8.4 Direction and Dispersion of Emissions

8.4.a. Have soft targets been evaluated for potential particulate dispersion?

Soil conditions may increase the dispersion of particulates and be subject to Clean Air Act NAAQS.

Yes ➡ Continue to 8.4.b

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, or apply engineering controls as required.

Yes ➡ Continue to 8.4.b

No ➡ Site is unsatisfactory

8.4.b. Have wind speed and direction been evaluated for impacts on potential sensitive receptors?

Wind speed and direction may disperse contaminants and impact local/sensitive receptors.

Yes ➡ Continue to 8.4.c

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ Continue to 8.4.c

No ➡ Go to Risk Management Considerations at end of matrix.

8.4.c. Has the terrain been evaluated for its potential to cause inversions?

Inversion conditions may be created in valleys or higher dispersement of emissions may occur in flat areas or desert-like areas.

Yes ➡ Continue to 9.1.a

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required (VFR considerations).

Yes ➡ Continue to 9.1.a

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

9. Climate

9.1 Precipitation

9.1.a. Have weather conditions been evaluated for impacts on mission?

Areas of high precipitation may increase the potential for migration of contaminants. Additionally, such areas may impact operation and maintenance activities (e.g., flooding or desert-like conditions).

Yes ➡ **Continue to 9.2.a**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 9.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

9.2 Temperature

9.2.a. Have temperature conditions been evaluated for impacts on mission?

May affect vapor emission rates. Additionally it may impact operation and maintenance activities (e.g., extreme hot or cold).

Yes ➡ **Continue to 9.3.a**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 9.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

9.3 Hazardous Weather Conditions

9.3.a. Have hazardous weather conditions been evaluated for impacts on mission?

Areas prone to hazardous weather conditions may impact mission and O&M (e.g., dust storms, high snowfall, hurricane-prone areas).

Yes ➡ **Continue to 9.4.b**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 9.4.b**

No ➡ Go to Risk Management Considerations at end of matrix.

9.4 Wind

9.4.a. Have wind conditions been evaluated for impacts on mission?

Wind may affect dispersion of emissions and impact O&M activities.

Yes ➡ **Continue to 10.1.a**

No ➡ Can a variance or mitigative measures be applied?

Monitor, evaluate, and apply engineering controls as required.

Yes ➡ **Continue to 10.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

10. Noise and Vibration

10.1 Aircraft and Ordnance

10.1.a. Have environmental conditions been evaluated for propagation of noise and vibrations?

Weather can have a considerable impact on the ability of noise to travel. Areas with little wind and very dry climate conditions can carry noise further. Additionally, low cloud cover can magnify noise conditions. In some cases large bodies of water can also act as an amplifier.

Yes ➡ **Continue to 10.2.a**

No ➡ Can a variance or mitigative measures be applied?

Observe the surrounding environment and conduct noise studies at greater distances if conditions warrant.

Yes ➡ **Continue to 10.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

10.2 Fauna

10.2.a. Has consideration been given to the impacts of noise and vibration on local animals?

Noise can impact animal production (e.g., milk, eggs) as well as breeding.

Yes ➡ **Continue to 10.3.a**

No ➡ Can a variance or mitigative measures be applied?

Noise created by munition impact, and aircraft approaches should be evaluated for impact on domesticated animals.

Yes ➡ **Continue to 10.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

10.3 Humans

10.3.a. Has consideration been given to the impacts of noise and vibration on local populations?

Noise can be a nuisance factor in populated areas.

Yes ➡ **Continue to 10.3.b**

No ➡ Can a variance or mitigative measures be applied?

Reference FAA regulations for aircraft operations over populated areas. In addition, consult with local authorities concerning noise ordinances. The RIM supports the MOA Range NOISEMAP to analyze subsonic aircraft noise impact and MicroBNOISE to develop blast noise contours.

Yes ➡ **Continue to 10.3.b**

No ➡ Site is unsatisfactory

10.3.b. Has consideration been given to the impacts of noise and vibration on future development?

Assess the direction of urban growth trends to ensure that urban sprawl does not present a future encroachment issue.

Yes ➡ **Continue to 10.3.c**

No ➡ Can a variance or mitigative measures be applied?

Reference FAA regulations for aircraft operations over populated areas. In addition, consult local authorities concerning noise ordinances. The RIM supports the MOA Range NOISEMAP to analyze subsonic aircraft noise impact and MicroBNOISE to develop blast noise contours. Future uses should be anticipated that might alter size requirements. By working with weapon planners and local developers, future incompatibilities can be minimized. Involve local community leaders, planners, and zoning boards to create easements and buffer zones around the range.

Yes ➡ **Continue to 10.3.c**

No ➡ Go to Risk Management Considerations at end of matrix.

10.3.c. Has consideration been given to the impacts of vibration on infrastructure or other industrial operations?

Vibrations may adversely impact industrial operations.

Yes ➡ **Continue to 10.4.a**

No ➡ Can a variance or mitigative measures be applied?

Avoid sensitive industrial areas (e.g., power plants) and residential or highly populated areas where blast or aircraft vibrations may have negative impacts.

Yes ➡ **Continue to 10.4.a**

No ➡ Go to Risk Management Considerations at end of matrix.

10.4 Terrain

10.4.a. Has consideration been given to the impacts of noise and vibration on local terrain?

Noise and vibrations can affect avalanche and landslide potential.

Yes ➡ **Continue to 11.1.a**

No ➡ Can a variance or mitigative measures be applied?

Engineering controls (e.g., controlled blasting) may be applicable.

Yes ➡ **Continue to 11.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

11. Visual Resources

11.1 Scenery

11.1.a. Has the range area been evaluated for negative aesthetic impacts?

Visual resources are a public concern and steps should be taken to reduce changes to the areas visible to the public.

Yes ➡ **Continue to 11.2.a**

No ➡ Can mitigative measures be applied?

Consider leaving untouched buffer surrounding range areas.

Yes ➡ **Continue to 11.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

11.2 Structures

11.2.a. Has the range area been evaluated for aesthetic impacts resulting from mission-related structures?

Large structures can be considered an eyesore (e.g., towers, fencing, above-ground storage tanks).

Yes ➡ **Continue to 11.3.a**

No ➡ Can a variance or mitigative measures be applied?

Consider painting the structure the same color as the surrounding area to camouflage, or other similar architectural enhancements.

Yes ➡ **Continue to 11.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

11.3 Clearcutting/Grading

11.3.a. Have clearcutting or grading activities been considered in their effects on local aesthetics?

The removal of vegetation, especially large tree stands, can create an eyesore if the public has direct eye contact with the area. In addition, major earth-moving operations can also create public issues because the regrading of an area and consequential stripping of vegetation results in unsightly terrain.

Yes ➡ **Continue to 12.1.a**

No ➡ Can a variance or mitigative measures be applied?

During the planning process, consideration should be given to the number of visual changes that will take place in the proposed area. Leave an untouched buffer surrounding range areas.

Yes ➡ **Continue to 12.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

12. Cultural/Archaeological Resources

12.1 Religious/Archaeological

12.1.a. Has the target area been evaluated for impacts to cultural or archaeological resources?

The Archaeological Resources Protection Act and Native American Burial Rights Act require that Federal Agencies evaluate the potential for cultural and archaeological resources on potential locations for construction. Local populations, based on their cultural heritage, may need access to such sites. Additionally, areas larger than the actual archaeological/burial site may be required so as to not interfere with spirit sites.

Yes ➡ **Continue to 12.2.a**

No ➡ Can a variance or mitigative measures be applied?

The mission must be evaluated to ensure safe access and protection of these areas as required.

Yes ➡ **Continue to 12.2.a**

No ➡ Site is unsatisfactory

12.2 Historical

12.2.a. Has the target area been evaluated for impacts to historically important resources?

National Historic Preservation Act (NHPA) requires that federal agencies evaluate the potential of cultural and archaeological resources (e.g., battlefields, National Historic Landmarks) on potential locations for construction.

Yes ➡ **Continue to 13.1.a**

No ➡ Can a variance or mitigative measures be applied?

These resources must be protected against damage or destruction unless properly documented and recorded according to the regulations set forth in the NHPA (Section 106). Must have consultation and coordination with the appropriate agencies (e.g., SHPO, Tribal Leaders).

Yes ➡ **Continue to 13.1.a**

No ➡ Site is unsatisfactory

SUSTAINABILITY MATRIX

13. Socioeconomics

13.1 Food and Water

13.1.a. Have range activities been evaluated for potential impacts on the local population's subsistence activities?

Range activities may impact the local population's ability to continue subsistence farming, fishing, and other similar activities.

Yes ➡ **Continue to 13.2.a**

No ➡ Can a variance or mitigative measures be applied?

Prior to siting the range/target area, ensure operations will not adversely impact the local population's ability to obtain food and water. In some cases it may be possible to provide access to alternative sources.

Yes ➡ **Continue to 13.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

13.2. Employment

13.2.a. Have range activities been evaluated for potential impacts on employment opportunities for the local population?

Range activities may have both positive and negative consequences on employment opportunities for local populations. In some cases the operations may be able to provide jobs; in other cases, it may create a situation where businesses choose to relocate.

Yes ➡ **Continue to 13.3.a**

No ➡ Can a variance or mitigative measures be applied?

In some cases negative consequences may be mitigated by providing education/training for alternative employment opportunities.

Yes ➡ **Continue to 13.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

13.3. Infrastructure

13.3.a. Have range activities been evaluated for potential impacts on public or private infrastructure?

Range construction and operations may impact local utilities or services (e.g., adequate water, power, or waste treatment, telephone).

Yes ➡ **Continue to 13.3.b**

No ➡ Can a variance or mitigative measures be applied?

Evaluate local services and upgrade as necessary. Ensure growth and expansion of services and utilities can meet future requirements.

Yes ➡ **Continue to 13.3.b**

No ➡ Go to Risk Management Considerations at end of matrix.

13.3.b. Have local utilities and services been evaluated for their ability to support range activities?

The ability of local municipalities to provide adequate services, such as roads, snow removal, power, and communication services, must be examined prior to construction.

Yes ➡ **Continue to 13.4.a**

No ➡ Can a variance or mitigative measures be applied?

Evaluate local services and upgrade as necessary. Ensure growth and expansion of services and utilities can meet future requirements.

Yes ➡ **Continue to 13.4.a**

No ➡ Go to Risk Management Considerations at end of matrix.

13.4. Environmental Justice

13.4.a. Have local population and socioeconomic conditions been evaluated?

Certain activities are considered undesirable (e.g., landfill, industrial). Care must be taken to not site such activities in an area of low-income or minority population that would bear a disproportionate number of adverse health, economic, and environmental effects.

Yes ➡ **Continue to 14.1.a**

No ➡ Can a variance or mitigative measures be applied?

Ensure that areas housing low-income or minority populations are not "under consideration" when siting or designing a range/target area (REF EO 12989).

Yes ➡ **Continue to 14.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

14. Public Relations

14.1. Services

14.1.a. Have impacts to local public services been evaluated?

Any changes to public services (e.g., transportation, utilities, access to public areas) need to be communicated to the public early in the process.

Yes ➡ **Continue to 14.2.a**

No ➡ Can a variance or mitigative measures be applied?

When siting a range or target area, consideration on how to minimize these disruptions should be included. In addition, any new services that may need to be developed due to range operations need to be determined and communicated to the affected public.

Yes ➡ **Continue to 14.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

14.2. Disruption of Activities

14.2.a. Have impacts to local activities been evaluated?

If the construction and use of range or target areas impact the daily activities of the surrounding populations, then local communities must be made aware of these issues.

Yes ➡ **Continue to 14.3.a**

No ➡ Can a variance or mitigative measures be applied?

To the extent possible, disruptions should be avoided as much as possible. If disruptions are unavoidable, scheduling with local officials should take place.

Yes ➡ **Continue to 14.3.a**

No ➡ Go to Risk Management Considerations at end of matrix.

14.3. Sensitive Resources

14.3.a. Have range operations and location been evaluated for impact on sensitive receptors?

The location of schools, hospitals, nursing homes, and daycare facilities should be considered.

Yes ➡ **Continue to 14.4.a**

No ➡ Can a variance or mitigative measures be applied?

Range and target activities should be located so that sensitive resources are not impacted by operations, including overflight, to the extent practical. Short-term impact from construction or other similar activities should be managed in such a manner as to minimize disturbance (e.g., only do construction during the day/normal working hours, dust suppression, traffic controls).

Yes ➡ **Continue to 14.4.a**

No ➡ Go to Risk Management Considerations at end of matrix.

14.4. Encroachment

14.4.a. Have range operations and location been evaluated for impacts resulting from encroachment of private and other public entities?

Local development must be monitored to ensure that civilian activities do not conflict with current and future operational needs.

Yes ➡ **Continue to 14.5.a**

No ➡ Can a variance or mitigative measures be applied?

The local zoning board or other local governmental agency may need to be contacted about development plans of areas off the range.

Yes ➡ **Continue to 14.5.a**

No ➡ Go to Risk Management Considerations at end of matrix.

14.5. Community Outreach

14.5.a. Have procedures been established to notify the public of significant activities?

At times civilians, NGOs, or local governments will require information on activities occurring on the range.

Yes ➡ **Continue to 14.6.a**

No ➡ Can a variance or mitigative measures be applied?

Protocol and avenues must be established and provided on a continuing basis.

Yes ➡ **Continue to 14.6.a**

No ➡ Go to Risk Management Considerations at end of matrix.

14.6. Regulatory/Local Government Cooperatives

14.6.a. Have cooperatives/Memorandum of Understanding been established?

Cooperatives are key in preventing environmental violations, as well as understanding potential legal actions that may affect future operations on the range.

Yes ➡ **Continue to 15.1.a**

No ➡ Can a variance or mitigative measures be applied?

Protocol and avenues must be established and provided on a continuing basis.

Yes ➡ **Continue to 15.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

15. Transport Systems

15.1 Land Access

15.1.a. Is the range accessible for mission requirements?

Ensure mission requirements can be adequately accomplished by providing access to target areas. Consider seasonal hazards such as ice, snow, flooding, and mud when evaluating year-round availability.

Yes ➡ **Continue to 15.1.b**

No ➡ Can a variance or mitigative measures be applied?

Implement engineering controls or alternate access mechanisms (e.g., boat, helicopter) as required.

Yes ➡ **Continue to 15.1.b**

No ➡ Go to Risk Management Considerations at end of matrix.

15.1.b. Is the access suitable for O&M activities?

Driving time, roads, and road conditions must be suitable for routine maintenance and UXO clearance and residue removal procedures.

Yes ➡ **Continue to 15.1.c**

No ➡ Can a variance or mitigative measures be applied?

Include any needed road or bridge construction in the mission and economic analysis.

Yes ➡ **Continue to 15.1.c**

No ➡ Go to Risk Management Considerations at end of matrix.

15.1.c. Are bridges required for access suitable in size to support O&M equipment?

Driving time, roads, and road conditions must be suitable for routine maintenance and residue clearance procedures.

Yes ➡ **Continue to 15.2.a**

No ➡ Can a variance or mitigative measures be applied?

Include any needed bridge construction.

Yes ➡ **Continue to 15.2.a**

No ➡ Go to Risk Management Considerations at end of matrix.

15.2 Transportation Infrastructure

15.2.a. Are access routes capable of handling DOT-Permitted Hazardous Materials/Waste?

It may be necessary to transport DOT-Permitted Materials/Waste as part of the range operations.

Yes ➡ **Continue to 15.2.b**

No ➡ Can a variance or mitigative measures be applied?

Required in accordance with 15.3. CFR 100-185. Assess alternative routes to access the target area.

Yes ➡ **Continue to 15.2.b**

No ➡ Site is unsatisfactory

SUSTAINABILITY MATRIX

15.2.b. Will public transportation corridors (land, air, and waterways) remain unaffected?

In some cases there may be a need to reroute public transportation corridors.

Yes ➡ **Continue to 15.2.c**

No ➡ Can a variance or mitigative measures be applied?

Rerouting of significant transportation corridors should be avoided.

Yes ➡ **Continue to 15.2.c**

No ➡ Go to Risk Management Considerations at end of matrix.

15.2.c. Will rail corridors remain unaffected?

In some cases there may be a need to reroute rail corridors.

Yes ➡ **Continue to 16.1.a**

No ➡ Can a variance or mitigative measures be applied?

Rerouting of significant rail corridors should be avoided. In some cases it may be possible to cease operations to allow rail movement.

Yes ➡ **Continue to 16.1.a**

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

16. Operations and Maintenance

16.1 Security

16.1.a. Have security issues been adequately addressed?

Appropriate levels of security should be considered in relation to the operations and location. Potential threats must be evaluated prior to establishing target areas and be continually monitored.

Yes ➡ Continue to 16.1.b

No ➡ Can a variance or mitigative measures be applied?

A system needs to be designed and implemented that will keep the target areas and surrounding areas free of unwanted personnel and activities.

Yes ➡ Continue to 16.1.b

No ➡ Go to Risk Management Considerations at end of matrix.

16.1.b. Have physical barriers been designed as part of range or target areas?

Appropriate levels of physical security should be considered in relation to the operations and location. In some circumstances, fences may need to be considered to limit access by the public to the target area (Ref. DODD 4715.11/.12).

Yes ➡ Continue to 16.1.c

No ➡ Can a variance or mitigative measures be applied?

Physical barriers must be designed to enhance mission security, but not cause adverse complications with natural flora and fauna (e.g., blocking migration routes).

Yes ➡ Continue to 16.1.c

No ➡ Go to Risk Management Considerations at end of matrix.

16.1.c. Have security personnel and monitoring been established for the range or target area?

Human reconnaissance must be integrated into the security system. Patrolling either on foot or by vehicle will require roads or paths. Ensure these do not create adverse conditions to natural resources.

Yes ➡ Continue to 16.2.a

No ➡ Can a variance or mitigative measures be applied?

In some cases, electronic surveillance systems may offset the need for remote area access by security personnel.

Yes ➡ Continue to 16.2.a

No ➡ Go to Risk Management Considerations at end of matrix.

16.2 Emergency Response

16.2.a. Can local Emergency Services support new mission requirements?

Evaluate Emergency Service capabilities (e.g., medical, fire suppression equipment) to support new mission requirements.

Yes ➡ Continue to 16.3.a

No ➡ Can a variance or mitigative measures be applied?

In some cases EMS personnel or equipment may have to be supplied or enhanced. Establish agreement for emergency EOD support with closest EOD unit.

Yes ➡ Continue to 16.3.a

No ➡ Go to Risk Management Considerations at end of matrix.

SUSTAINABILITY MATRIX

16.3 Fire

16.3.a. Are precautions taken to minimize unwanted fires?

Naturally initiated burns can cause UXO to become unstable, release toxic constituents into the environment, restrict access, and impact mission effectiveness. In addition, opens issues of invasive species.

Yes ➡ **Continue to 16.3.b**

No ➡ Can a variance or mitigative measures be applied?

Develop and implement a Fire Control Plan (Ref: AFI 32-2001).

Yes ➡ **Continue to 16.3.b**

No ➡ Go to Risk Management Considerations at end of matrix.

16.3.b. Are controlled burns established as part of target area/range maintenance?

Controlled burns can minimize the adverse impacts of naturally initiated burns.

Yes ➡ **Continue to 16.3.c**

No ➡ Can a variance or mitigative measures be applied?

Develop and implement a Fire Control Plan (Ref: AFI 32-2001).

Yes ➡ **Continue to 16.3.c**

No ➡ Go to Risk Management Considerations at end of matrix.

16.3.c. Are fire breaks established?

Fire breaks can minimize the adverse impacts of naturally initiated burns; however, they can also have adverse impacts on wildlife and natural resources, and can create erosion issues.

Yes ➡ **Continue to 16.4.a**

No ➡ Can a variance or mitigative measures be applied?

Develop and implement a Fire Control Plan (REF: AFI 32-2001). Use GIS to route breaks in a manner that minimizes unwanted disturbances to natural resources, and apply engineering controls to minimize erosion and sediment transport issues (e.g., berms, backfill, ground cover) (Ref: Sikes Act).

Yes ➡ **Continue to 16.4.a**

No ➡ Go to Risk Management Considerations at end of matrix.

16.4 Power Systems

16.4.a. Have the power requirements to support the mission been evaluated?

Construction and maintenance of power systems must be evaluated for meeting mission and O&M requirements. This includes the maintenance aspects of generation and distribution systems.

Yes ➡ **Continue to 16.5.a**

No ➡ Can a variance or mitigative measures be applied?

New or enhanced generation and distribution systems may be required. Consider implications to natural and cultural resources.

Yes ➡ **Continue to 16.5.a**

No ➡ Go to Risk Management Considerations at end of matrix.

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16.5 Water Systems

16.5.a. Have water requirements to support the mission been evaluated?

Construction and maintenance of water supply and distribution must be evaluated for meeting mission and O&M requirements (e.g., dust suppression during range maintenance). This includes the maintenance aspects of the systems.

Yes ➡ **Continue to 16.6.a**

No ➡ Can a variance or mitigative measures be applied?

New or enhanced supply and distribution systems may be required. Consider implications to natural and cultural resources. In some cases discharges may require NPDES permits.

Yes ➡ **Continue to 16.6.a**

No ➡ Go to Risk Management Considerations at end of matrix.

16.6 Wastewater Systems

16.6.a. Have wastewater requirements to support the mission been evaluated?

Construction and maintenance of wastewater treatment and discharge must be evaluated for meeting mission and O&M requirements. This includes the maintenance aspects of the systems.

Yes ➡ **Continue to 16.7.a**

No ➡ Can a variance or mitigative measures be applied?

Ensure the appropriate environmental documentation is completed prior to the construction of any treatment or discharge facilities.

Yes ➡ **Continue to 16.7.a**

No ➡ Go to Risk Management Considerations at end of matrix.

16.7 Communication

16.7.a. Have requirements for communication systems been established?

Construction and maintenance of communication equipment and facilities must be evaluated for meeting mission and O&M requirements (e.g., scoring systems and aircraft control, and ground party communications). This includes the maintenance aspects of the systems.

Yes ➡ **Continue to 16.7.b**

No ➡ Can a variance or mitigative measures be applied?

Communication facilities can often invite unwanted wildlife. Evaluate impact on wildlife and apply wildlife management controls.

Yes ➡ **Continue to 16.7.b**

No ➡ Go to Risk Management Considerations at end of matrix.

16.7.b. Have construction impacts of communication systems been evaluated?

Construction and maintenance of communication equipment and facilities may impact natural and cultural resources.

Yes ➡ **Continue to 16.8.a**

No ➡ Can a variance or mitigative measures be applied?

Ensure the appropriate environmental analysis is conducted prior to the construction of any facilities.

Yes ➡ **Continue to 16.8.a**

No ➡ Go to Risk Management Considerations at end of matrix.

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16.8 Maintenance–Generated Wastes

16.8.a. Have waste streams been identified?

The generation and disposition of solid waste, oil/fuels from target or range vehicles, hazardous waste, low-level radioactive waste, construction debris, or natural wastes (e.g., shrubs, plants, trees) must be adequately evaluated.

Yes ➡ **Continue to 16.9.a**

No ➡ Can a variance or mitigative measures be applied?

Develop and implement a Solid Waste Management Plan, Hazardous Waste Management Plan, and/or Recycling Plan. For large ranges or ranges in remote locations, a solid waste landfill may need to be considered.

Yes ➡ **Continue to 16.9.a**

No ➡ Go to Risk Management Considerations at end of matrix.

16.9 UXO Management

16.9.a. Have written agreements (policy agreements/MOU) with the closest military EOD unit been established for emergency support?

Ref. AFJI 32-3002. UXO can occur off-range or in the contaminant area.

Yes ➡ **Continue to 16.9.b**

No ➡ Can a variance or mitigative measures be applied?

Establish an MOU. If response will be in excess of 4 hours, ensure that coordination takes place with local law enforcement/ Major Command.

Yes ➡ **Continue to 16.9.b**

No ➡ Go to Risk Management Considerations at end of matrix.

16.9.b. Has programmed UXO clearance support been established with military EOD or contractual civilian UXO company?

Ref. AFI 32-3001 and 13-212. Periodic UXO clearance is required for safety purposes.

Yes ➡ **Continue to 16.9.c**

No ➡ Can a variance or mitigative measures be applied?

Ensure long-term availability of military EOD or contracted UXO clearance/removal support.

Yes ➡ **Continue to 16.9.c**

No ➡ Go to Risk Management Considerations at end of matrix.

16.9.c. Have periodic UXO clearance activities/criteria been coordinated with range owners (for ranges owned by another service)?

MOUs may be required from other agencies (e.g., USMC, Army, Navy) to support UXO clearance requirements.

Yes ➡ **Continue to 16.9.d**

No ➡ Can a variance or mitigative measures be applied?

Contracted UXO support may need to be considered.

Yes ➡ **Continue to 16.9.d**

No ➡ Go to Risk Management Considerations at end of matrix.

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16.9.d. Have NEW limits for EOD operations been established?

EOD operations may require net explosive weight (NEW) limits greater than the munitions used and this will impact the amount of buffer area required to support this type of operation.

Yes ➡ **Matrix Complete**

No ➡ Can a variance or mitigative measures be applied?

Is some cases NEW limits may be decreased by limiting detonation size.

Yes ➡ **Matrix Complete**

No ➡ Go to Risk Management Considerations at end of matrix.

D.3 Risk Assessment

Finally, each consideration ends with a site assessment as follows: Continue, Site Unsatisfactory, Do Not Pursue, and Risk Management Decision. In the case of Risk Management Decision, further discussion of associated risks or issues is provided in the following chapters. To assist with this reference, each critical issue is labeled with the chapter and paragraph in which the topic is addressed in further detail.

Risks are identified under the following five specific areas:

1. Operational—These are negative impacts to mission requirements. (For example, this may impact the time of day or approaches that aircraft can take when using a target.)
2. Logistic/Resource—These are adverse impacts to logistical support or resources. (For example, access to remove target scrap may require road or bridge construction, or there may be significant cost considerations.)
3. Safety—In these cases there may be significant safety considerations. (For example, operating in extreme weather conditions, or having to wear excess protective equipment.)
4. Environmental—These actions may adversely impact natural or cultural resources. (For example, implementation may destroy habitat or limit access to burial grounds.)
5. Public—The risks in this category may cause consternation among local populations or negative impacts on community support. (For example, reduction in hunting access, or excess noise generation.)

In many cases there is more than one risk associated with a decision. The text only attempts to identify those decisions that will result in a significant risk determination. The following table references specific considerations identified in the text to its potential risk category. (In some cases a consideration may fall under more than one risk category):

Risk Management Considerations

Risk Category	Risk
Operational	3.1.c, 4.3.a, 4.3.b, 5.3.a, 6.2.b, 6.3.a, 6.5.a, 8.4.c, 9.1.a, 10.2.a, 10.3.b, 10.3.c, 16.1.a, 16.3.a
Logistic/ Resource	3.1.d, 3.1.e, 3.7.a, 3.8.a, 3.9.a, 5.2.a, 5.3.a, 7.2.a, 7.3.a, 7.3.b, 7.4.a, 9.1.a, 9.2.a, 9.3.a, 13.1.a, 13.2.a, 13.3.a, 13.3.b, 14.5.a, 15.1.a, 15.1.b, 15.1.c, 15.2.b, 15.2.c, 16.1.b, 16.1.c, 16.2.a, 16.3.a, 16.3.b, 16.3.c, 16.4.a, 16.5.a, 16.6.a, 16.7.a, 16.8.a, 16.9.b, 16.9.c
Safety	3.1.e, 3.9.a, 4.3.b, 5.3.a, 6.1.a, 6.2.a, 6.3.a, 6.2.b, 6.5.a, 6.6.a, 9.2.a, 9.3.a, 10.4.a, 16.1.a, 16.1.b, 16.2.a, 16.3.a, 16.3.b, 16.3.c, 16.7.a, 16.8.a, 16.9.a, 16.9.b, 16.9.c

Risk Management Considerations (Continued)

Risk Category	Risk
Environmental	3.6.a, 3.7.a, 3.8.a, 3.9.a, 4.3.a, 4.3.b, 5.2.a, 7.1.a, 7.1.c, 7.2.a, 7.4.a, 8.4.b, 9.4.a, 10.1.a, 10.2.a, 10.4.a, 11.3.a, 16.3.a, 16.3.b, 16.3.c, 16.7.b, 16.8.a, 16.9.b
Public	6.2.b, 6.3.a, 6.5.b, 6.6.a, 8.2.b, 10.2.a, 10.3.b, 10.3.c, 11.1.a, 11.2.a, 11.3.a, 13.1.a, 13.2.a, 13.3.a, 13.3.b, 13.4.a, 14.2.a, 14.3.a, 14.4.a, 14.5.a, 14.6.a, 15.2.c

D.4 Implementation

While the matrix cannot identify every individual concern facing a target area, it does provide a comprehensive overview of the potential impacts and considerations facing target sustainability. In addition, it is highly recommended that a cross-functional team be used in concert with this document when designing or evaluating a proposed target area. Such a team may be composed of personnel from the Range Squadron or office (including the airspace manager), pilots using the range, Engineering, Maintenance Engineering, CE Operations, contracting, and environmental. This will ensure optimal design and sustainability success. It is imperative, however, that mission needs be properly identified and justified up front. Users must know exactly what needs to be accomplished and why. This information must then be successfully conveyed to the designers and planners. Only when sound mission requirements can be effectively communicated to all impacted parties will users realize maximum land use sustainability.

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GLOSSARY

ACTS	Air Combat Training Systems
AF	Air Force
AFI	Air Force Instruction
AFJI	Air Force Joint Instruction
AFJMAN	Air Force Joint Manual
AFREP	Air Force Representative
AFRL	Air Force Research Laboratory
AR	Actual Range
ARPA	Archaeological Resource Protection Act
ASTM	American Society for Testing and Materials
ATV	All-Terrain Vehicle
BASH	Bird Aircraft Strike Hazard
BDU	Bomb Dummy Unit
CAA	Clean Air Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CO	carbon monoxide
CRMP	Cultural Resource Management Plan
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DOD	Department of Defense
DODD	Department of Defense Directive
DODI	Department of Defense Instruction
DOE	Department of Energy
DOPAA	Description of the Proposed Action and Alternatives
DOT	Department of Transportation
EIAP	Environmental Impact Analysis Process
EO	Executive Order
EOD	Explosive Ordnance Disposal
EPCRA	Emergency Preparedness and Community Right-to-Know Act
FAA	Federal Aviation Administration
FAC	Forward Air Controllers
FAR	Federal Aviation Regulations
FBI	Federal Bureau of Investigation
FCC	Federal Communications Commission

GLOSSARY
(Continued)

FIH	Flight Information Handbook
FL	Flight Level
FOIA	Freedom of Information Act
HAPs	hazardous air pollutants
HE	High Explosive
IP	initial point
JAWSS	Joint Advanced Weapon Scoring System
JMGT	Joint Modular Ground Target
JTCTS	Joint Tactical Combat Training System
LANTIRN	Low Altitude and Targeting Infrared for Night
LOWAT	low-altitude training
MOAs	Military Operations Areas
MOUs/MOAs	Memorandums of Understanding or Agreements
MR_NMAP	MOA Range NOISEMAP
MTRs	Military Training Routes
NAAQS	national ambient air quality standards
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NEPA	National Environmental Policy Act
NEW	Net Explosive Weight
NGO	Non-Governmental Organization
NHPA	National Historical Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NOx	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operations and Maintenance
PAs	military public affairs
PM	particulate matter
RCO	range control officer
RCRA	Resource Conservation and Recovery Act
RIM	Range Information and Mapping
RF	radio frequency
SO_x	sulfur oxides
SUA	special use airspace
T/TSNS	Test and Training Space Needs Statement

TC	titanium tetrachloride
TO	Technical Orders
TOSS	Television Ordnance Scoring System
TRI	toxic release inventory
TSP	total suspended particulate
USC	United States Code
USDA	U.S. Department of Agriculture
UST	underground storage tank
VOC	volatile organic compound
VFR	visual flight rules
WP	white phosphorus
WSFA	weapon safety footprint area

Definitions

Arroyo – A steep ditch or gully, usually dry. It is carved in a plain or desert by drainage resulting from a heavy rainfall.

Class A Airspace – Generally, that airspace from 18,000 mean sea level (MSL) up to and including Flight Level 600 (60,000 feet), including the airspace overlying the waters within 12 nautical miles (NM) of the coast of the 48 contiguous states and Alaska. Unless otherwise authorized, all personnel must operate their aircraft under Instrument Flight Rules (IFR). (Per Chapter 14 of FAA Order 7400.2E)

Despecularization – Removal of reflective surfaces such as metals and glass. Some surfaces may require painting to reduce reflection.

MicroBNOISE – Software program used to develop blast noise contours for ordnance delivery.

Range – Designated land, and water areas set aside, managed, and used to research, develop, test, and evaluate military munitions, other ordnance, or weapons systems, or to train military personnel in their use and handling. Ranges include firing lines and positions, maneuver areas, firing lanes, test pads, buffer zones, detonation pads, Target Areas, and Hazard areas. It includes the restricted airspace above the range.

Range Residue – Material including, but not limited to: practice bombs; expended artillery; small arms and mortar projectiles; bombs and missiles; rockets and rocket motors; hard targets; grenades; incendiary devices; experimental items; demolition devices; berms; and any other material fired on, or upon a military range. (Ref: AFI 13-212 VI)

Restricted Airspace – A restricted area is airspace established under 14 CFR part 73 provisions, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. (Per Chapter 23 of FAA Order 7400.2E)

Target Area – The area on a range complex that immediately surrounds the target or designated mean point of impact. The Target Area demarcation should normally be no less than 1,000 feet from the center of the target or designated mean point of impact.